WPS5227

Policy Research Working Paper 5227

Rethinking Market Discipline in Banking

Lessons from the Financial Crisis

Constantinos Stephanou

The World Bank
Financial and Private Sector Development Vice Presidency
Financial Policy Development Unit
March 2010

Policy Research Working Paper 5227

Abstract

The main objective of this paper is to rethink the use of market discipline for prudential purposes in light of lessons from the financial crisis. The paper develops the main building blocks of a market discipline framework, and argues for the need to take an expansive view of the concept. It also illustrates using actual bank case studies from the United States its apparent failures in the crisis, particularly the failure to prevent the buildup of systemic, as opposed to idiosyncratic, risks. However, while the role of market discipline in the design of macro-prudential regulation appears to be largely constrained, more can be done on the micro-prudential side to promote clearer market signals of bank riskiness and to encourage their use in the supervisory process.

This paper—a product of the Financial Policy Development Unit, Financial and Private Sector Development Vice Presidency—is part of a larger effort in the department to rethink the use of market discipline for prudential purposes in light of lessons from the financial crisis. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The author may be contacted at cstephanou@worldbank.org.

Rethinking Market Discipline in Banking: Lessons from the Financial Crisis

by

CONSTANTINOS STEPHANOU[*]

Keywords: market discipline, Basel II, financial crisis, banking, financial regulation, contingent capital, bank securities.

[*] Constantinos Stephanou (cstephanou@worldbank.org) is a Senior Financial Economist in the Financial and Private Sector Development Vice Presidency of the World Bank. The paper reflects solely the views of its author and does not necessarily reflect the views of the World Bank Group or its Executive Directors. The author would like to thank Haocong Ren for excellent research assistance, and express his appreciation to Augusto de la Torre, Alain Ize, Michael Fuchs, Jim Hanson, Roberto Rocha, Jonathan Katz, and Erik Feyen for useful comments and suggestions.

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I. Introduction

The use of market discipline (MD) for prudential purposes has gained importance in recent years as policymakers have increasingly recognized its role and incorporated it in their regulatory frameworks. This is exemplified by the codification of MD as one of the three pillars in the supervisory architecture for internationally active banks (Basel II) and insurance companies (Solvency II).

However, the global financial crisis has exposed important limitations of MD and has cast doubts on its underlying premise of efficient markets and on its effectiveness as a prudential mechanism. In fact, several commentators[1] have expressed their dismay with the way that market participants did not identify and sufficiently punish (at least on an *ex ante* basis) those banks that took excessive risks and subsequently failed or had to be rescued at great cost to taxpayers.

The main objective of this paper is to rethink the use of MD for prudential purposes in light of the financial crisis. There are two key conclusions stemming from the analysis. First, there is a need to take an expansive view of MD that includes key elements of a modern market-based system whose existence, at least until recently, was taken for granted in developed countries. Second, empirical evidence presented in the paper suggests that MD failed to exert itself sufficiently early to prevent the buildup of *systemic*, as opposed to *idiosyncratic*, risks during the 'good times'. Of course, once the crisis took hold, MD seems to have played its role broadly as expected, with banks perceived to be weaker being punished more severely than stronger ones.

Both conclusions carry important policy implications. Recognition of the need for a more expansive view of MD would imply significant reforms in the way that the concept is currently treated in the prudential framework, which focuses predominantly on transparency and disclosure. On the other hand, the inability of MD to adequately address systemic risk means that its role in the design of any future macro-prudential regulation will likely be severely constrained. However, more can be done on the micro-prudential side to promote clearer market signals of bank riskiness and to encourage their use in the supervisory process.

The paper is structured as follows:

- Section II reviews the existing literature on this concept and develops an analytical framework that captures the main building blocks of MD;
- Section III illustrates with the use of actual bank case studies, and attempts to explain using the analytical framework, the apparent failures of MD in this crisis;
- Section IV briefly describes crisis-induced policy reforms currently under way that would affect the functioning of MD, and explores additional ways to improve it so that it can support – to the extent possible – prudential objectives; and
- Section V summarizes the main findings and draws some policy implications on the value and limitations of this concept.

[1] For example, the U.K. Financial Services Authority (March 2009) challenges the efficient market theory upon which MD is predicated and states that "*the events of the last five years have illustrated the inadequacy of market discipline: indeed, they suggest that in some ways, market prices and market pressures may have played positively harmful roles*". See also Roubini (March 2008) and De Grauwe (December 2008).

II. The Concept of Market Discipline

Definition

The definition varies in the literature but, in its broadest terms, MD is the mechanism via which market participants monitor and discipline excessive risk-taking behavior by banks. As some commentators have pointed out[2], MD has less to do with the market *per se* and more about the institutional framework – information, incentives, and control – used to reduce the problems of moral hazard and asymmetric information that are endemic in banking.

MD has recently been playing a greater role on prudential matters as well. It has become increasingly important with the development of capital markets, globalization, conglomeration, and innovation that have limited the ability of supervisors to adequately monitor banks given their increasing size, cross-border activities and complexity. Under this viewpoint, official supervisory action and MD are seen as complementary and self-reinforcing. Bank regulation stems from the twin objectives of protecting retail depositors and avoiding the substantial welfare costs associated with the systemic effects of a bank failure. However, banks might not be adequately disciplined – at least on an *ex ante* basis – by official supervision. This can arise from unavoidable informational asymmetries between the bank and its supervisor, or because of forbearance due to political considerations or other reasons (e.g. weak legal protection of supervisors). The existence of market participants with the resources, expertise and incentives to monitor banks provides an additional tool of discipline that complements official supervision and may also limit forbearance (i.e. supervisory discipline). Taken together, appropriate regulations can enhance the disciplining power of markets, while market signals can provide relevant information and incentives for bank and supervisory actions.

Some commentators and policymakers have gone beyond this viewpoint and asserted that MD can actually replace financial market regulation and supervision to a certain extent. In fact, the regulatory philosophy in several developed countries had relied heavily over the last two decades on the self-correcting properties of markets and the self-interest of sophisticated financial institutions. This set of beliefs supported a financial deregulation trend that was exemplified by less intrusive supervision, the lack of new regulations on rapidly growing unregulated financial players (e.g. hedge funds) and instruments/markets (e.g. over-the-counter derivatives), the dependence of new prudential rules on market-based measures of risk (e.g. capital requirements in Basel II), and the reduction in existing regulatory restrictions (e.g. the repeal of the Glass-Steagall Act in the U.S. in 1999, allowing commercial banks to fully enter the securities business).

The increased emphasis on MD is exemplified by its codification in recent international prudential standards, such as Pillar 3 in the Basel II Framework (and more recently in Solvency II)[3]. It is interesting to note that the Basel II document does not even define MD, even though it

[2] Hellwig (October 2005) views MD as part of the wider discussion on corporate finance and corporate governance, specifically as another manifestation of the 'banks versus markets' debate. He attributes the eminence of the term on the emotional appeal of its association with markets and the market-based system rather than on the analytical rigor of the concept.

[3] See Basel Committee on Banking Supervision (June 2006) for details.

mandates various types of information disclosures by banks to strengthen it. The main objectives of Pillar 3 are to complement the other two Pillars by enabling market participants to obtain key qualitative and quantitative information on banks' capital, risk profile, and risk assessment processes in a consistent and comparable format[4]. Implementation experience to-date has been mixed, with some supervisors taking a hands-off approach – at least until the onset of the financial crisis – by arguing that Pillar 3 disclosures are something that banks and market participants need to work out between themselves.

The implicit assumption underlying the use of MD for prudential purposes is that most banking problems are idiosyncratic and associated with principal-agent frictions stemming from information asymmetries and inadequate contract enforcement that generate moral hazard and lead to excessively risky behavior. In those situations, it is argued that MD can better align the incentives of the agents with those of the principals by enabling the latter to more effectively discipline the former. Some authors had already pointed out that MD does not work well in environments in which systemic factors dominate idiosyncratic risk[5], but this was not considered to be an issue for countries with developed financial systems and stable macroeconomic policies.

It is also important to conceptually distinguish different types of MD. *Direct* MD refers to the control or influence that market participants themselves can exert on a bank's risk-taking behavior. By contrast, *indirect* MD is brought about by regulatory intervention triggered by market signals (e.g. price movements of bank securities). Moreover, one can view bank runs, share price collapses, forced takeovers, and class action lawsuits as forms of *ex post* MD; however, for the concept to fulfill its prudential purpose, MD also needs to operate preemptively on an *ex ante* basis, i.e. to discourage excessive risk-taking behavior by banks because of its damaging consequences.

Framework

While the concept itself is intuitive, the mechanisms by which MD can function under different financial system structures and institutional contexts remain unclear. The existing broad, albeit fragmented[6], literature on MD describes the concept and its application in specific instances, emphasizing the need for disclosures, providing incentives to monitor via a properly designed safety net, and strengthening private property rights. However, beyond these high-level (and generally irrefutable) objectives, there is relatively little guidance on how much to rely on and on how to operationalize the concept under different financial system structures and institutional environments – what Llewellyn (March 2005) calls the 'black box' of MD. This makes it difficult for policymakers to ascertain the limitations of MD given their specific market and institutional characteristics, and to design a comprehensive set of policies to promote it.

[4] Bank management can determine the appropriate medium and location of disclosures – for example, as part of accounting or other statutory disclosure requirements (e.g. for publicly-listed firms) or via other means (e.g. websites or public regulatory reports). Pillar 3 disclosures are not required to be audited by an external auditor unless otherwise required by accounting or other regulatory authorities.

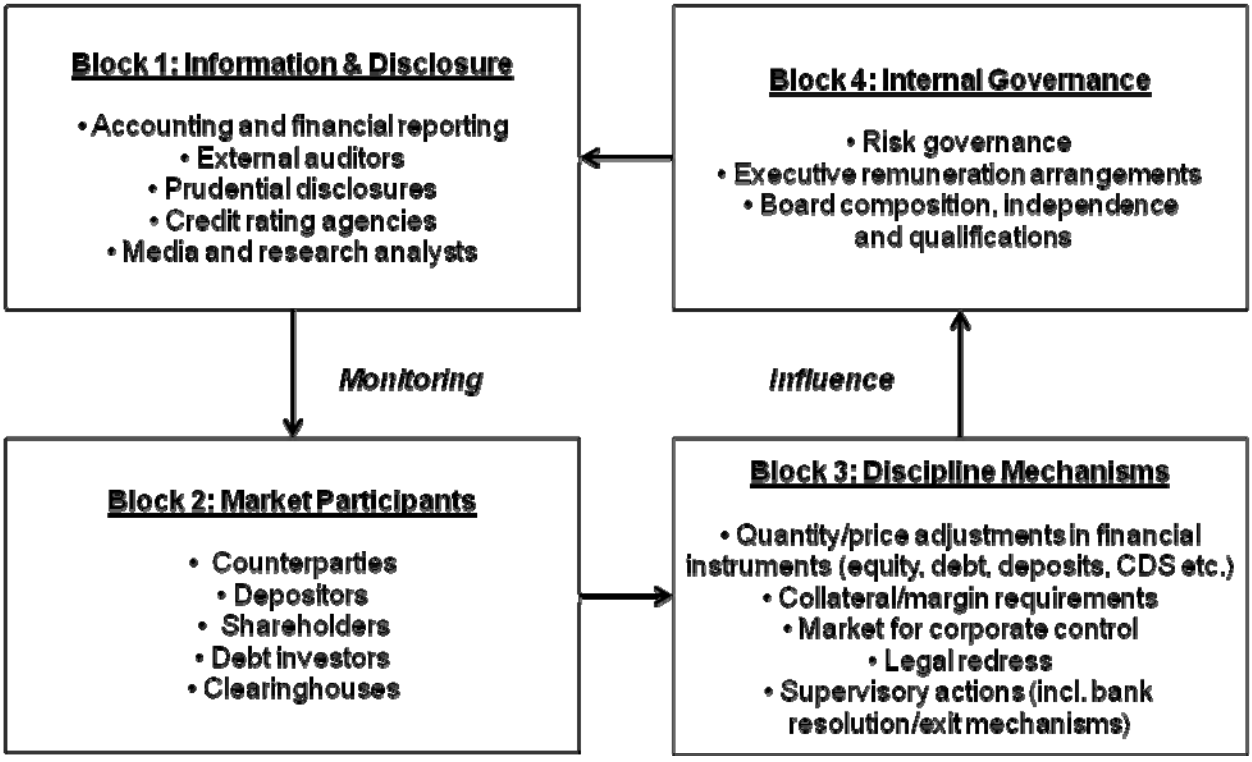
[5] See Levy Yeyati et al (October 2004) for a study of depositor behavior during the systemic bank runs in Argentina and Uruguay in 2000-02. They illustrate that as systemic risk increases, the informational content of bank fundamentals declines, indicating that the notion of MD needs to account for systemic risk in emerging economies.

[6] There are various different – and not always connected – strands in the literature (e.g. design of safety nets, mandatory subordinated debt issuance, depositor discipline, transparency and disclosure etc.).

In an attempt to overcome this problem and to facilitate the analysis in this paper, an MD framework has been developed (see Figure 1). In the context of a given macroeconomic environment and financial system structure, it comprises four interrelated building blocks:

a. Building block 1: *Information and disclosure* – the public availability of adequate, timely, consistent and reliable information on the bank's financial performance and risk exposures
b. Building block 2: *Market participants* – the existence of independent market participants with the incentives to monitor the bank and the ability to accurately process the information that it discloses
c. Building block 3: *Discipline mechanisms* – the various instruments, whether financial, legal, or supervisory (indirect MD), that market participants can use to exercise discipline
d. Building block 4: *Internal governance* – the organizational and compensation structures that determine whether insiders (senior management and Board of Directors) understand and control the risks that the bank is taking, and are incentivized to change their behavior in response to market signals.

Figure 1: Market Discipline Framework



The framework is primarily based on the existing literature on this topic. For example, Crockett (2002) mentions four preconditions for MD to be effective in ensuring financial stability: sufficient information, ability to process it correctly, right incentives, and existence of mechanisms to exercise discipline. Scott (2004) formulates three general requirements for an acceptable level of MD: a market in the financial instruments of the issuer, enforceable credit

contracts, and a market for corporate control. Llewellyn (March 2005) identifies information, the abundance of 'stakeholder monitors' with the interest and right incentives to monitor a bank, efficient markets through which price and quantity adjustments can take place, and appropriate incentives for bank management to adjust their behavior in response to such signals. Bliss and Flannery (March 2001) introduces two distinct components to the MD concept: the ability of investors to evaluate a firm's true condition (monitoring), and the responsiveness of firm managers to investor feedback as reflected in security prices (influence). Similarly, Hamalainen et al. in Kaufman (ed., 2003) distinguish between a recognition phase and a control phase for effective MD, each with its own conditions.

As can be seen, the framework is fairly broad in scope and covers areas where conventional wisdom, at least until recently, took for granted in developed countries. These include some of the legal and institutional underpinnings of a modern market-based system, such as sound accounting rules, well-functioning market 'gatekeepers' (auditors, credit rating agencies etc.), active and liquid markets, and an effective court system. The building blocks can be analyzed sequentially (i.e. from information disclosure to market reaction to bank response), but they also form a feedback loop with each other. While opinions might differ as to whether they constitute the 'right' set of building blocks[7], greater importance should be placed on whether the framework captures reasonably well all the relevant pieces of an effective MD architecture.

A host of empirical studies generally support the proposition that market participants can differentiate the riskiness of banks and price them accordingly in environments where idiosyncratic risk dominates, although evidence on their ability to influence bank behavior is mixed[8]. The literature also suggests that there are a number of regulatory policies that can be undertaken to address impediments to MD[9] – for example:

- lowering the cost of private monitoring, e.g. via additional disclosure requirements as well as more reliable and timely information
- raising the incentives for monitoring by market participants, e.g. increasing the cost of private bank failure by redesigning safety nets and credibly committing not to not bail out failing firms
- increasing the incentives for bank management to respond to market signals, e.g. by strengthening corporate governance arrangements.

The above framework captures these issues and makes explicit the need for a comprehensive and consistent set of regulatory policies to support MD – in fact, a given regulatory policy can be relevant across more than one building blocks. For example, the design of safety nets influences the incentives of market participants to monitor banks (block 2), the consequent price movements in bank instruments (block 3), the incentives of insiders to change their behavior (block 4), and possibly the type/amount of information that is disclosed to the market (block 1).

[7] For example, one could argue that credit rating agencies belong to the second and/or third building block. The reason they have been included in the first block is that they have preferential access to confidential information by the banks that they rate, and can be therefore viewed as 'insiders' rather than purely external market participants.
[8] See Tarullo (August 2008) for a recent review of the literature.
[9] Llewellyn (March 2005) separates impediments to MD into those that are structural and those that are policy-induced. According to him, the former are more applicable to developing countries, and include the lack of information, the presence of state-owned banks, greater forbearance, more extensive deposit insurance schemes, and smaller capital markets.

III. Financial Crisis Failures

Inadequate Market Signals

As has been pointed out by various critics, market prices and credit ratings did not provide adequate or timely signals to banks (or their supervisors) on the buildup of risks during the 'good times'. By contrast, once the crisis hit, and particularly after the U.S. authorities allowed the failure of Lehman Brothers in September 2008 allegedly in an attempt to restore MD, market participants punished the prices of bank securities harshly.

In order to validate this criticism, information was collected on the evolution since 2006 in the prices of different types of instruments – equity, debt and 5-year credit default swaps (CDS) – for a small set of U.S. banks (Citigroup, Bear Stearns, Lehman Brothers). Those banks were selected because they took, at least with hindsight, excessive risks and the financial crisis caused them to fail (Lehman Brothers, September 2008) or to be rescued via arranged takeovers (Bear Stearns, March 2008 – sold to J.P. Morgan) and *ad hoc* government support packages (Citigroup, November 2008 and February 2009). As can be seen in Table 1, the securities used in the analysis (whenever available) span the capital structure of a typical large U.S. bank, and their different risk characteristics allow a comparison of their price sensitivity.

Table 1: Typical Capital Structure of a U.S. Bank

	Type of Bank Security	Position in the Capital Structure	Main Risk of Loss
Loss Absorption Capacity ↓	Senior Debt	Outside regulatory capital	Regulatory intervention or bank default
	Subordinated Debt	Tier II capital (if remaining maturity is longer than 5 years)	Some interest deferral (without necessarily triggering bank default) or debt-equity exchange
	Trust Preferred Shares (TruPS) and Enhanced Trust Preferred Shares (E-TruPS)	Generally Tier I capital (innovative hybrid securities)	Interest deferral (without necessarily triggering bank default) or debt-equity exchange
	Preferred shares	Tier I capital (particularly if noncumulative and perpetual)	Dividend suspension (without necessarily triggering bank default) or conversion to common stock
	Common shares	Tier I capital	Bank losses

Source: CreditSights (29 March 2009).

The movement of prices prior to and during the crisis, both across different instruments of the same bank and for each of the selected bank instruments vis-à-vis a suitable market benchmark, was analyzed. Market benchmarks were created by forming a composite (simple average) of similar instruments by appropriate peers for each of the selected banks. In the case of Citigroup, the peers were two other large U.S. diversified banks (JP Morgan and Bank of America), while in the case of Bear Stearns and Lehman Brothers the peers were the three other major stand-alone U.S. investment banks (Goldman Sachs, Morgan Stanley, Merrill Lynch). The purpose was twofold: (1) to identify the most risk sensitive instruments that provided the earliest warning signals; (2) to ascertain whether those price signals captured the bank's idiosyncratic behavior as opposed to broader market-wide price movements. The objective of this exercise was to establish whether (and when) MD began to function for these banks in the crisis.

Appendix I contains graphs depicting the evolution in the price of different instruments for the three banks and their respective market benchmarks since early 2006. Appendix II describes

the analysis that was used to determine whether (and when) the price divergence of different bank instruments from their market benchmarks became statistically significant, while Appendix III shows the main characteristics of the securities that were used. The analysis is subject to several qualifications (choice of time period and of suitable market benchmarks, comparability of similar instruments across different banks, assumption of normally behaved prices of different instruments etc.) and additional data (e.g. traded volume information by type of instrument) and more sophisticated statistical techniques can be employed to corroborate and expand on the results. However, the analysis presented in this paper is sufficient for the purposes of drawing a few broad conclusions about price behavior and market signals.

The main stylized facts can be summarized as follows. First, the prices of some bank instruments, including market benchmarks, only began to decline in the second half of 2007 and accelerated their downward spiral following the events of March 2008 (collapse and takeover of Bear Stearns) and September 2008 (conservatorship of Fannie Mae and Freddie Mac, bankruptcy of Lehman Brothers, government intervention in AIG). As can be expected, the timing of the initial price declines corresponds roughly to the steep drop in quarterly earnings results announced by these banks[10]. Second, once the additional risks of the three banks started to become apparent to market participants, there was some differentiation in the prices of their instruments compared to their respective benchmarks. This differentiation started to take place a few months in advance of their eventual failure/intervention date. Finally, the prices of CDS, equity and (sometimes) hybrid securities generally responded faster and more strongly than the prices for subordinated and senior debt. In fact, in some cases (e.g. Lehman Brothers), the price of the senior debt remained close to par and to the market benchmark until the very end.

Breakdowns in the Various Building Blocks

The above stylized facts remain inevitably open to different interpretations, some of which are inconsistent with the basic premise of MD that markets are efficient and that market prices are good indicators of economic value. In particular, for those who believe that risks accumulate during 'good times' and only manifest themselves during 'bad times', it is difficult to dispute the notion that the efficient market hypothesis is wrong and that MD failed to exert itself sufficiently early. On the other hand, one could argue that markets are dynamic, that other banks had similarly risky positions as the banks under analysis prior to the crisis, and that it was only the bad decisions subsequently taken by the management of these three banks (e.g. not pulling back from risky activities when it became obvious and prudent to do so) that was the trigger for action by market participants. In any case, the two views are not necessarily inconsistent, since the former is concerned more with assessing the overall *absolute* level of risk in the financial system while the latter is focused primarily on the *relative* risk of the three banks vis-à-vis their peers.

Once the crisis took hold, MD seems to have played its role as expected (and perhaps more than desired), with banks perceived to be weaker being punished more severely than stronger ones. However, the crisis has also demonstrated that MD can be a fairly crude *ex post* instrument and that attempting to re-impose discipline in the middle of a crisis (as is alleged to have been the case for Lehman Brothers) can have significant adverse repercussions to overall market

[10] The banks under analysis began to report significant earnings declines either for the second quarter of 2007 (Bear Stearns) or for the third quarter of that year (Lehman Brothers, Citigroup).

confidence. Using the aforementioned framework, one can analyze the possible breakdowns across the various building blocks that explain the way that MD has worked.

The literature on MD assigns great importance to block 1 on information and disclosure. This emphasis is in response to the perception that past banking problems have partly stemmed from a lack of transparency on the true level of exposures and on risk management practices. Under this viewpoint, increased disclosure improves monitoring and leads to greater bank incentives to control risks (reduction of principal-agent problems).

However, some commentators[11] point out that the information being disclosed was inaccurate or incomplete for several reasons. Accounting rules were criticized for allowing banks to hide exposures off-balance sheet via the use of special-purpose vehicles, as well as for exacerbating procyclicality in bank profits (i.e. overvaluations during good times and excessive write downs during the crisis) by promoting inappropriate marking-to-market of assets and discouraging loan loss provisioning across the cycle. Financial reporting standards were deemed excessively complex and focused on quantity, as opposed to quality, of bank disclosures. Regulatory standards (e.g. Basel II's capital rules) promoted procyclical market-based measures of risk and permitted risk disclosures and metrics that were in retrospect insufficiently granular or comparable across banks. Banks used risk methodologies and measurement models that did not capture the true amount of risk (e.g. as in structured finance). Finally, credit ratings provided little warning to market participants – in fact, as can be seen in the graphs in Appendix I, market pricing remained consistently ahead of the ratings provided by the credit rating agencies (CRAs).

An active set of diverse stakeholders is an essential precondition for effective monitoring and signaling under blocks 2 and 3 of the MD framework. Shareholders can influence the behavior of bank management through various means, including the market for corporate control (mergers and acquisitions)[12], stock price ('voting with their feet'), corporate governance arrangements (e.g. compensation packages), and the court system (e.g. director liability and investor protection rules). Their actions can also serve as warning signals to the authorities and thereby help precipitate supervisory actions to discipline bank management. According to the MD literature, it is uninsured debt holders who represent the most important bank monitors because of the asymmetric payout nature of their contracts (no upside benefit), making them less tolerant to excessive risk-taking[13]. Their exposure can take various forms, including bonds, interbank placements, derivatives contracts, and uninsured deposits. They can influence bank behavior through price/quantity effects, collateral/margin arrangements, and debt covenants, and can be privy to better information because of additional private disclosure requirements.

[11] See, for example, Brunnermeier et al. (January 2009).

[12] However, the market for corporate control has historically been a rarely-used mechanism – compared with other sectors – to exercise MD for poorly-performing banks. As with the bankruptcy process, takeover of banks is significantly more complex than takeovers in other industries. Hostile takeovers are extremely rare (especially for large banks) and bank supervisors typically need to approve any transactions.

[13] The option-like character of equity holdings (limited liability and residual claims) implies that shareholders may not be relied upon to exercise discipline if the increase in the risk of failure is offset by increased probability of higher return, as in the case of the so-called 'gambling for resurrection' strategy. However, the equity market remains an important signaling tool and is often used as an early warning system for risk-taking behavior – for example, popular credit risk models employed nowadays by trading desks (e.g. Moody's KMV) use equity prices to 'back out' expected probabilities of default.

However, market participants failed to sufficiently monitor or react to banks' risk-taking behavior ahead of the crisis, partly due to the procyclical and incomplete information that they had been receiving[14]. In fact, quite the opposite seems to have happened – shareholders actively encouraged banks to take on greater risks in order to match or exceed the performance of their peers[15]. This type of herding behavior is well-exemplified by the statement of former Citigroup CEO Chuck Prince in an interview with the Financial Times in July 2007: "*when the music stops, in terms of liquidity, things will be complicated. But, as long as the music is playing, you have got to get up and dance. We are still dancing*".

Moreover, anecdotal evidence suggests that debt holders relied excessively on credit rating agencies and on the CDS market to monitor and control their bank exposures, both of which proved unreliable in retrospect. Even though some of the banks ultimately failed or were intervened because they were rapidly becoming illiquid[16], there is little evidence that large uninsured depositors or counterparties were taking pre-emptive action by moving their holdings or reducing their exposures significantly in advance of such events[17].

There is also some evidence that market participants' incentives to monitor and discipline banks were blunted by too-big-to-fail considerations, especially after the arranged takeover of Bear Stearns by J.P. Morgan in which the debt holders and CDS counterparts of the former were protected. In fact, the aforementioned difference in pricing behavior across different bank securities may not be solely due to their position in the capital structure but could also reflect the market's expectation of likely government support to prevent the default of systemically important banks. This perception may have given comfort to the holders of those classes of securities (e.g. senior debt) that would only lose if such an event materialized; this is most obvious in the case of Lehman Brothers, where the price of senior debt remained fairly steady throughout the crisis until it collapsed upon the bank's default. The absence of a resolution regime for systemically important non-bank financial institutions in the U.S., including for bank holding companies, may also have led market participants to expect the authorities to keep such institutions afloat. By contrast, holders of capital instruments that would lose value even if no bank default took place – such as preferred shares – were more risk sensitive as illustrated by price movements in those instruments.

Finally, the MD literature recognizes the importance of governance (building block 4) as a necessary factor to align the interests of principals (stakeholders) and agents (senior management and the board of directors). In the specific case of banks, strengthening governance is essential given their opaque nature and public interest entity status, and is a 'first line of defense' in

[14] More disturbingly, it seems that key counterparties did not sufficiently monitor and discipline banks even in cases where the relevant information was publicly available. See, for example, Frankel (December 2009) for an analysis of the 2007 failure of New Century Financial.

[15] Hellwig (November 2008) argues that "*market discipline as a mechanism of corporate governance [by shareholders] is intrinsically biased in favor of strategies that involve greater risk-taking*".

[16] For example, the demise of Bear Stearns prior to its arranged takeover has been attributed to the decision of other market players not to roll over short-term repos with it, resulting in a rapid loss of working capital.

[17] Information on the evolution of deposits (Citigroup) and reverse repos (Bear Stearns and Lehman Brothers) over this time period was also collected. However, such information is less frequent (it is mostly reported on a quarterly basis) and did not provide sufficient granularity or direction to draw definitive conclusions.

dealing with prudential problems. Good governance provides incentives for bank 'insiders' to exercise appropriate oversight and to disclose adequate, timely and reliable information on performance and risk exposures that allow MD to work more effectively (block 1). The large number of stakeholders places higher expectations on bank boards and calls for an elaborate system of 'checks and balances'.

However, the crisis has exposed deep governance failures. Following Ard and Berg (forthcoming), they can be categorized into four broad areas. First, there were failures in risk governance – as the Senior Supervisors Group (6 March 2008) point out, risk management systems were deficient, relevant organizational functions were weak, and there was limited board oversight of risks, resulting in their mis-measurement and mispricing. Second, incentive-based compensation was excessive as executives were seen to "reach for short-term yield" at the expense of long term firm stability and value. Third, as Nestor Advisors (April 2009) mention in their analysis of six investment banks, boards of directors were not as independent or qualified as governance codes required. Finally, institutional shareholders remained mostly inactive and preferred to "vote with their feet" rather that striving to improve governance practices in financial institutions. As a result, boards and senior management did not adequately understand, monitor or control the risks that their institutions were taking. Moreover, the market signals that they were receiving prior to the crisis did not indicate stakeholder concerns until it was too late.

IV. Improving Market Discipline

Announced Policy Measures

The regulatory response of the international community has been sizeable and multi-pronged. Several of the problems that were identified and described in the previous section are currently being addressed via various reform measures or proposals[18]. Although such proposals have not been discussed as part of a 'MD solution', they are in fact ways to strengthen MD using the logic of the aforementioned framework.

With regards to block 1, the crisis has accelerated the process of revising accounting standards and ensuring greater convergence across different standard-setters (International Accounting Standards Board and the U.S. Financial Accounting Standards Board). These involve revisions in three main areas: introducing more flexibility in loan loss provisioning to allow forward-looking through-the-cycle approaches (e.g. expected loss provisioning), tightening rules on the consolidation of off-balance sheet exposures, and clarifying (mostly by limiting) the application of fair value accounting for different types of financial instruments. Reforms in financial reporting are also being undertaken with a view to reducing complexity.

Regulatory proposals regarding CRAs aim to address their demonstrated failings in structured finance as well as to increase their oversight so that it is commensurate to their reliance for regulatory purposes[19]. This includes efforts to improve the transparency and quality of the ratings process as well as to restrict and manage conflicts of interest. Measures to address the over-reliance of supervisors and market participants on ratings are also under review although, as they currently stand, they will likely do little to change the business model or the cartelized industry structure.

The crisis has intensified the debate on the adequacy of Basel II, and has prompted the Basel Committee to propose measures to strengthen specific elements of all Pillars of the framework. These include, for example, tightening capital charges for certain types of exposures (re-securitizations, trading book, over-the-counter derivatives etc.) and raising the quality of regulatory capital under Pillar 1, strengthening the guidelines for supervisory review under Pillar 2, expanding risk disclosures under Pillar 3, as well as introducing a leverage ratio and minimum liquidity standards[20]. However, the fundamental philosophy of the Accord – namely, reliance on banks' internal risk models and on market prices for determining regulatory capital requirements – remains unchanged.

With regards to blocks 2 and 3, the policy responses that have been announced to-date have ambiguous effects on the incentives of market participants to better monitor excessive risk-taking by banks. On the one hand, proposals to address the moral hazard stemming from systemically important financial institutions that are "too big/interconnected to fail" – particularly the establishment of a resolution regime that would allow them to be wound down efficiently –

[18] See Stephanou (June 2009) and the Financial Stability Board (7 November 2009) for recent overviews of the reform agenda.
[19] See Katz et al. (October 2009) for an overview of regulatory reforms for CRAs.
[20] See Basel Committee on Banking Supervision (July 2009a and b, and December 2009) for details.

should make their uninsured creditors more risk sensitive and perhaps incentivize such institutions to better control their risk-taking. On the other hand, however, the significant expansion in deposit insurance coverage and lender-of-last resort facilities during the crisis raises the question of longer-term changes to their design. Some changes that have already been introduced are likely to become permanent such as, for example, higher deposit coverage and the elimination of the co-insurance component. This would blunt the incentives of depositors to monitor bank behavior. Moreover, the interplay between the new macro-prudential framework and safety net design – in particular, how to clearly demarcate the boundaries of safety nets under a broader regulatory perimeter and how to price them appropriately – is still undefined.

With regards to block 4, bank governance reforms have primarily focused on executive compensation plans, with international bodies developing principles and standards on sound compensation practices and asking national supervisory authorities and private firms to implement them[21]. A more important role for risk managers as well as greater independence, stronger qualification standards, and greater involvement in risk management issues by board members, are other regulatory solutions that may be introduced to address this problem. Providing a greater role to bank shareholders in executive remuneration and board composition matters has also been proposed, but it remains a controversial issue.

Limitations and the Way Forward

Whether the proposed reforms are actually sufficient to address the failures of MD in this crisis can only be assessed in years to come – in fact, the true testing of the new framework can only take place once the crisis measures are rolled back and the regulatory reforms are implemented. However, it is unlikely that the reforms will be able to effectively address what is conceivably the greatest weakness of the concept, namely its inability to properly respond to the buildup of *systemic*, as opposed to *idiosyncratic*, risk in the financial system[22]. This topic has not been given sufficient attention in the MD literature, which has tended to focus primarily on assessing whether market participants are able to identify and punish individual weak banks. The financial crisis illustrates that MD cannot be relied upon sufficiently to tackle systemic risks in a preemptive way that would prevent the need for disruptive and costly *ex post* market adjustments. It is therefore questionable whether proposals to involve market participants in pricing and/or providing insurance against systemic risks would be very effective, although a lot will depend on the nature of the incentives provided and their risk-sharing properties.

In fact, some commentators[23] argue that there is an inherent trade-off between MD and financial stability. Their argument is that even in an ideal world where all the building blocks of the MD framework work harmoniously together, the effectiveness of the concept is limited to mitigating idiosyncratic risks associated with principal-agent problems and moral hazard. This does not necessarily align the incentives of individual market players with those of the entire

[21] See Financial Stability Forum (April 2009) and Financial Stability Board (September 2009) for details.
[22] The corollary of this proposition, as stated by the U.K. FSA (March 2009), is that "*it is quite possible, for instance, that efficient and liquid markets provide useful and accurate price signals as to the relative attractiveness of different equities or credits even if the overall level of prices is subject to irrational overshoots*".
[23] See de la Torre and Ize (February 2009) for a description of the characteristics and contrasting prudential implications arising from the existence of different financial paradigms. See also chapter 8 of Inter-American Development Bank (2004).

financial system if there are un-internalized externalities and mood swings ("animal spirits"). In fact, the reverse may take place – namely, policies aimed at mitigating the problems of externalities and mood swings may actually exacerbate agency problems. For example, while MD depends on the lack of an extensive safety net that would minimize monitoring incentives by market participants, financial stability can be enhanced via the introduction of deposit insurance that reduces the possibility of systemic problems from bank runs. If that is the case, then the optimum amount of MD may well depend on the types of shocks that affect the banking system and the extent to which problems are idiosyncratic or systemic in nature. In the latter situation, MD cannot ensure that risks are adequately contained, and policies to promote it might actually worsen the situation[24].

While the role of MD in the design of macro-prudential regulation appears to be largely constrained, more can be done on the micro-prudential side. However, progress can only be achieved if one recognizes that the building blocks of MD extend well beyond transparency and disclosure. This would imply significant reforms in Pillar 3 of Basel II, which implicitly assumes that the preconditions already exist for the market to utilize information effectively to exercise discipline. A reconstituted Pillar 3 would need to include policies to support MD across all the building blocks of the framework, including appropriate regulation and oversight of the various financial 'gatekeepers' (e.g. external bank auditors, CRAs etc.), market participants and discipline mechanisms (e.g. collateral/margin requirements, bank resolution etc.), and bank governance arrangements (e.g. remuneration rules, board composition criteria etc.). Unless such reforms are undertaken, Pillar 3 will remain the weakest pillar of the Basel II Framework since it suffers from too many structural limitations to be of much use for MD purposes.

Two examples of potential reforms to promote MD as part of a micro-prudential framework are the creation of a specialized convertible debt instrument ('contingent capital') that could provide clearer signals on bank riskiness, and the increased use of market information by banking supervisors as an early warning signal to improve the identification of troubled banks and to act earlier to resolve budding problems.

Several academics and financial economists have proposed in the past the mandatory periodic issuance of subordinated debt by banks as a way to promote MD[25]. Under this proposal, banks would be required to regularly issue a small amount of debt with a minimum maturity that would also qualify as regulatory capital[26]. The inability to regularly issue this debt, or the level of yield demanded by investors, would signal the bank's riskiness to supervisors as well as increase its cost of funding as a disciplining device. However, as previously mentioned, the price of

[24] In the words of Persaud (July 2009), "*One reason that market discipline was seen as such an important pillar in the pre-crisis approach to banking regulation was the implicit model that regulators had in mind: financial crashes occur randomly as a result of a bad institution failing, and that failure becomes systemic. The historical experience is rather different: crashes follow booms. In the boom almost all financial institutions look good, and in the bust almost all look bad. Differentiation is poor. The current crisis is another instance of this all-too-familiar cycle*".

[25] See Board of Governors of the Federal Reserve System and U.S. Department of the Treasury (December 2000), Benink and Wihlborg (August 2001), VanHoose (February 2007), and Tarullo (August 2008).

[26] Additional features could include the debt's frequent rollover by banks (to provide primary market signals and therefore avoid any secondary market illiquidity problems), its purchase solely by independent institutional investors (as opposed to the banks themselves or the retail public), and a ceiling on the yield that can be accepted (to avoid situations whereby a junk bond yield has a sufficiently high coupon to compensate the risk of default).

subordinated debt for the three banks under analysis generally adjusted relatively late compared to equity and some types of hybrid capital, both because of their respective rank in the capital structure and because of the fact that a bank generally has to fail – and is therefore subject to too-big-to-fail considerations – before the holders of such instruments lose out.

The market's focus on tangible common equity and tier 1 capital, as opposed to total regulatory capital, as an indicator of bank financial strength during the crisis has prompted a revision of the quality of capital rules by the Basel Committee. One solution would be for standard-setters to support the adoption of a mandatory, standardized convertible debt instrument – at least for systemically important financial institutions – that would automatically convert to common equity when specific pre-defined triggers are met (e.g. bank losses that exceed a certain threshold or breach minimum regulatory capital requirements) but before the bank reaches the failure point and needs to be resolved or saved. This type of hybrid instrument could be included in a revised definition of regulatory capital. In addition to providing greater *ex post* private sector risk-bearing capacity during the 'bad times', it could potentially also provide useful *ex ante* price signals on bank riskiness. This is because investors in such instruments would be incentivized to better monitor banks since the probability of government intervention to save them would presumably be significantly reduced[27].

Finally, there has been some discussion in the literature about the use of market information by supervisors in their bank assessment process. The price behavior of the different instruments for the three banks under analysis in this paper indicates that such information would have been useful and would have allowed supervisors a head start to develop suitable contingency plans. It is unclear at this stage whether (and how broadly) such information is actually being used by supervisory agencies[28], but one way to further promote its use would be to explicitly include monitoring of the various forms of MD mechanisms for banks – including changes in market prices/quantities of various bank instruments, collateral/margin requirements etc. – as part of the supervisory review process in Pillar 2 of Basel II.

[27] See Squam Lake Working Group on Financial Regulation (April 2009) and Flannery (October 2009) for recent proposals on the use of contingent capital for large and distressed financial institutions. Similar proposals were floated even before the crisis – see, for example, Flannery (November 2002) on the introduction of 'reverse convertible debentures' as a type of contingent capital instrument to strengthen MD.

[28] Hamalainen et a. (2008) review the evidence on Northern Rock and conclude that U.K. supervisory authorities could have been alerted earlier on the basis of equity market signals.

V. Conclusions

The broad global trends that have accompanied the growth in financial markets and the increased complexity and size of financial institutions over the last few decades have made MD an increasingly important tool to complement official supervision. This has been recognized by policymakers who have incorporated it in their prudential frameworks in recent years.

While the concept itself is intuitive, the mechanisms by which MD can function under different financial system structures and institutional contexts remain unclear. In an attempt to overcome this problem and to facilitate the analysis, a MD framework based on the existing literature has been developed in this paper. The framework covers areas where conventional wisdom, at least until recently, took for granted in developed countries, and makes explicit the need for a comprehensive and consistent set of regulatory policies to support MD.

The paper draws some lessons from the crisis by analyzing the evolution in the prices of different types of instruments – equity, debt and CDS – for three major U.S. banks. It shows how MD, at least as proxied by the prices of those instruments, failed to exert itself sufficiently early to prevent the buildup of systemic risks prior to the crisis. Of course, once the crisis took hold, MD seems to have played its role as expected (and perhaps more than desired), with banks perceived to be weaker being punished more severely than stronger ones.

Using the aforementioned framework, one can analyze the possible breakdowns across the various MD building blocks and review the regulatory responses of the international community to these problems. It is an open question, and one that the paper does not tackle, whether these problems actually became worse as a result of the de-regulatory trends of the past two decades. However, what is clear in retrospect is that too much faith had been placed on MD as a prudential tool, and that the crisis has showed its limitations.

Whether the proposed reforms are actually sufficient to address the failures of MD in this crisis can only be assessed in years to come. However, it is unlikely that the reforms will be able to adequately address the inability of MD to respond to the buildup of *systemic*, as opposed to *idiosyncratic*, risk in the financial system. In fact, there may even be an inherent trade-off between MD and financial stability to the extent that policies to promote the former may exacerbate problems with the latter. If that is the case, then the optimum amount of MD may well depend on the types of shocks that affect the banking system and the extent to which problems are idiosyncratic or systemic in nature.

While the role of MD in the design of macro-prudential regulation appears to be largely constrained, more can be done on the micro-prudential side. Recognition of the need for a more expansive view of MD would imply significant reforms in the way that the concept is currently treated in the prudential framework, which focuses predominantly on transparency and disclosure. Two examples of additional reforms to promote MD are the creation of a specialized convertible debt instrument (‘contingent capital’) that could provide clearer signals on bank riskiness, and the increased use of market information in supervisory processes to improve the identification of troubled banks and to act earlier to resolve budding problems.

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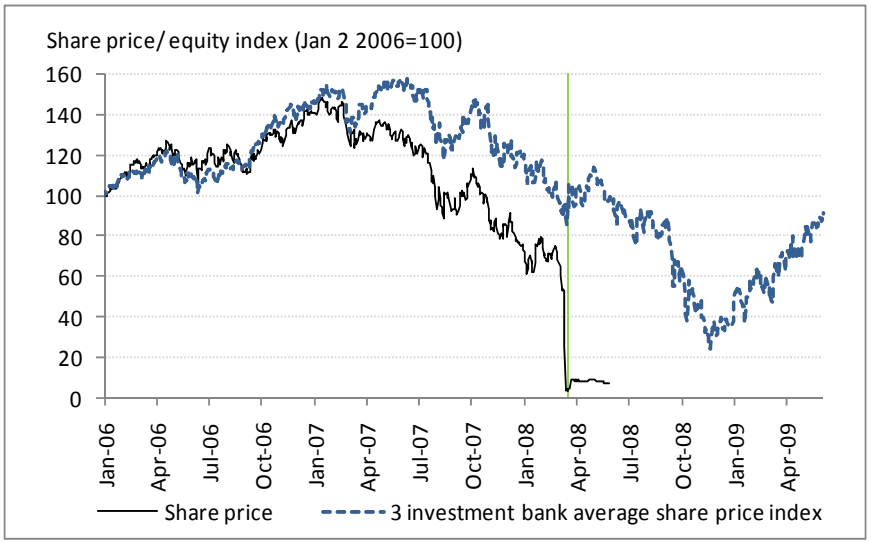
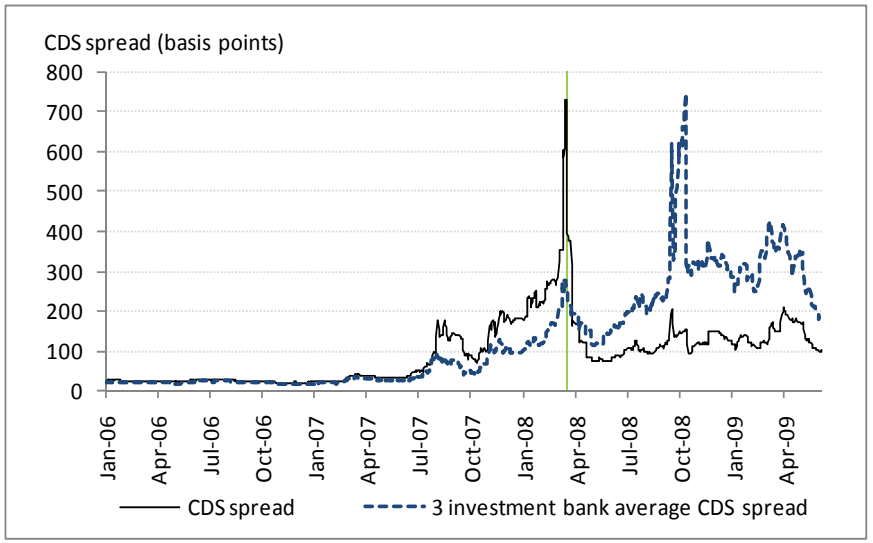
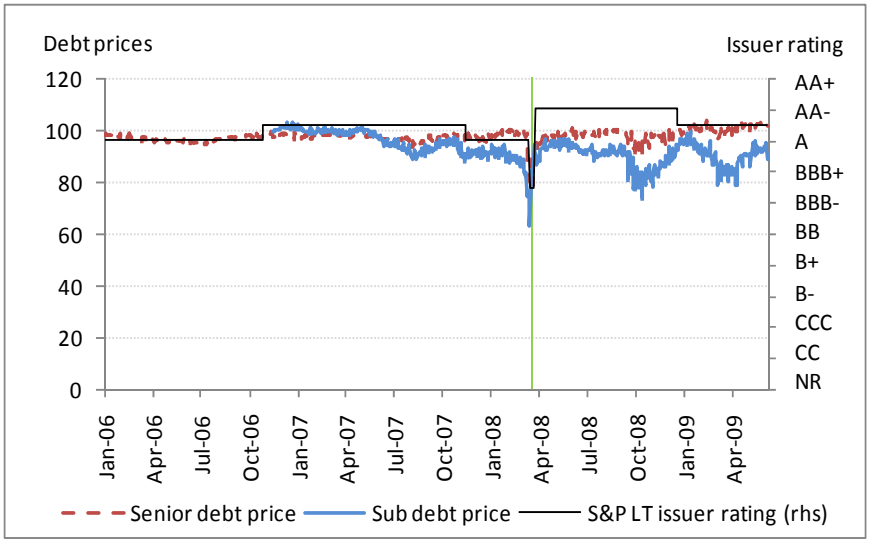
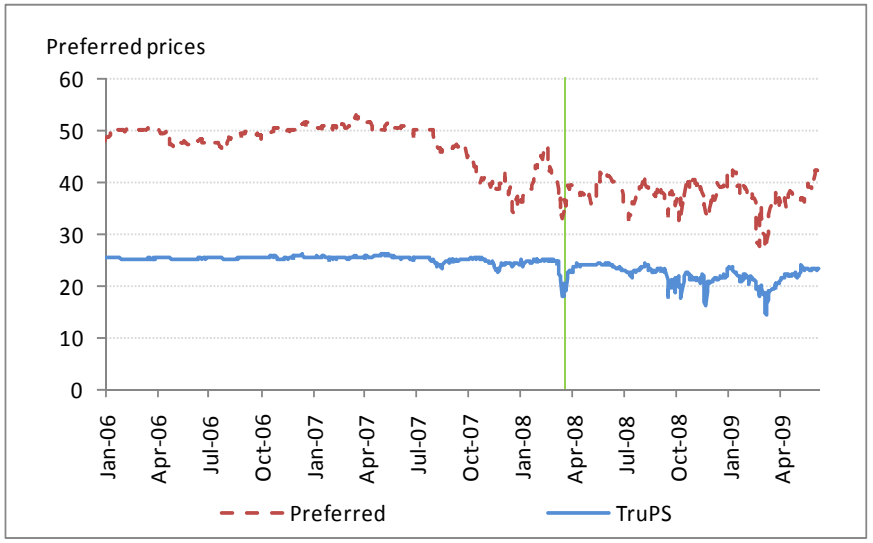
Appendix I: Evolution of Prices for U.S. Bank Instruments

Bear Stearns









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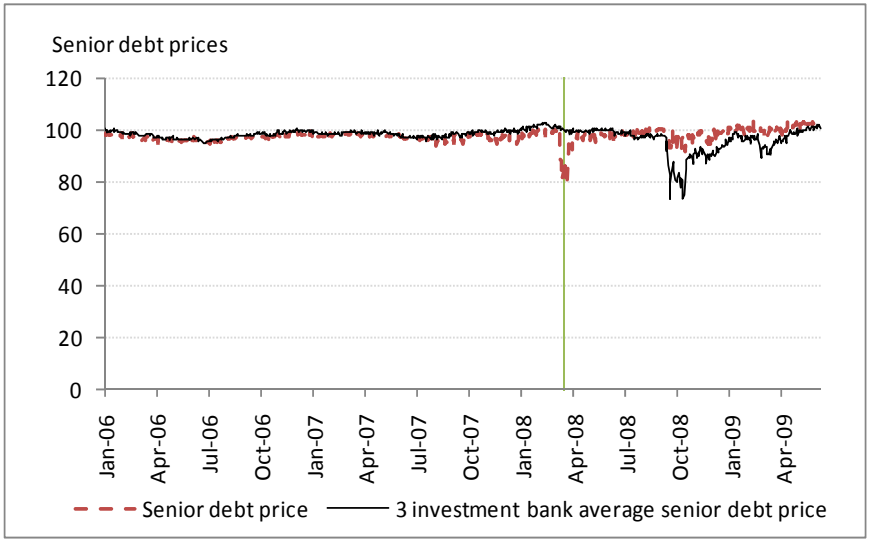
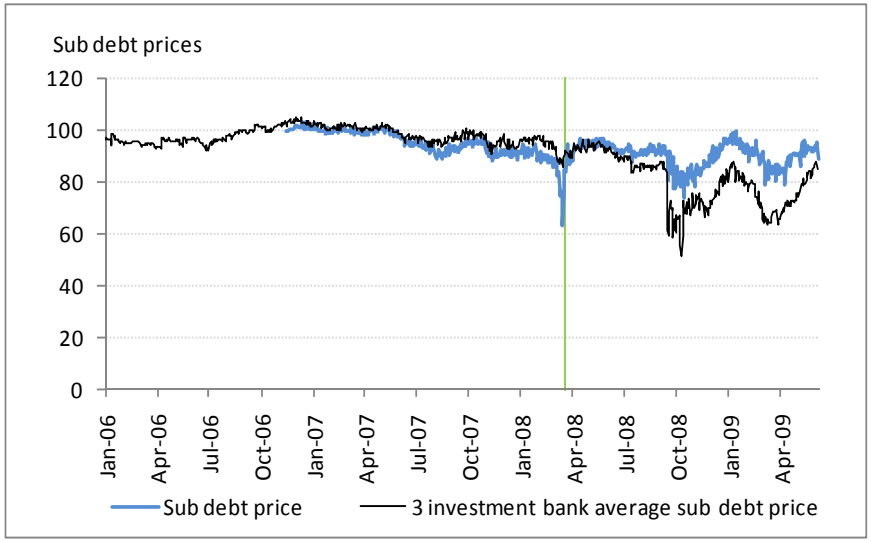
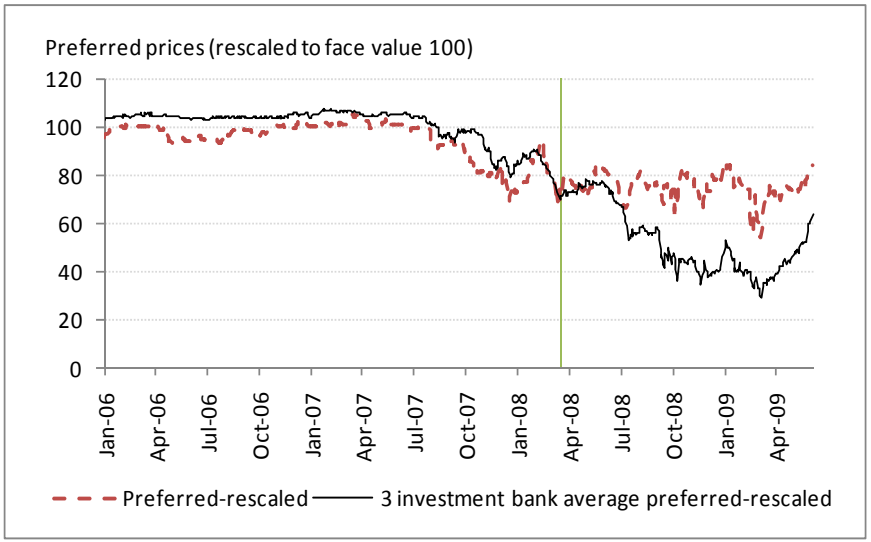
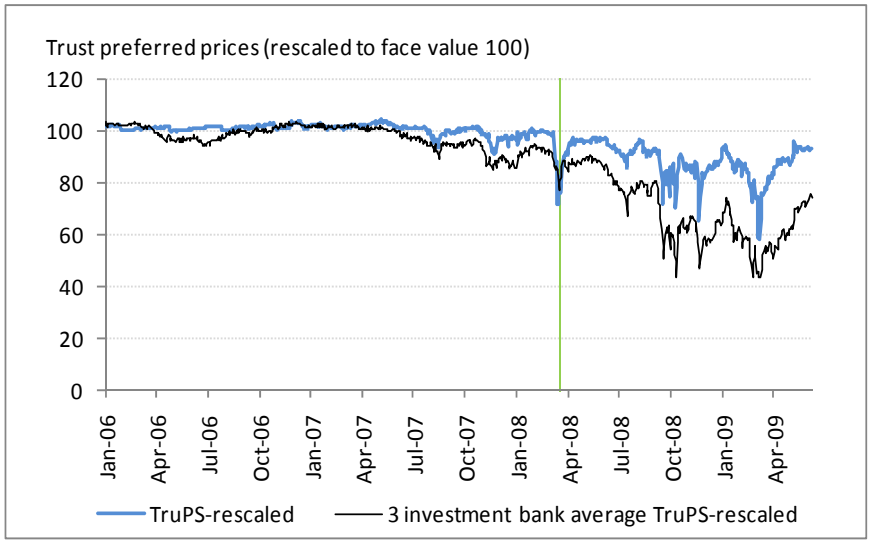
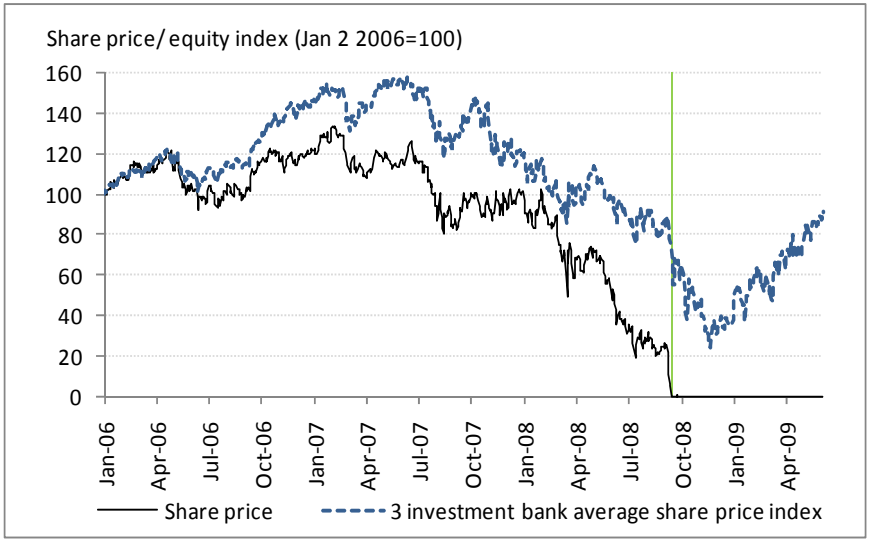


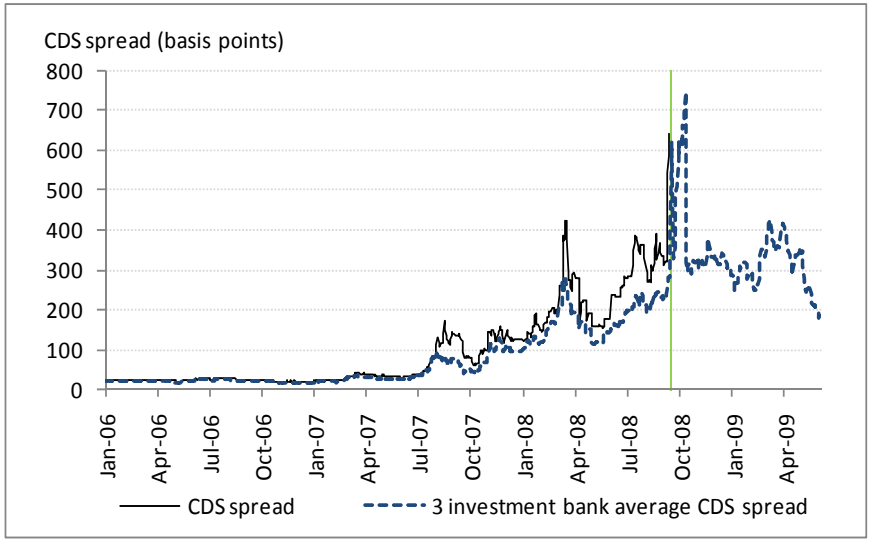


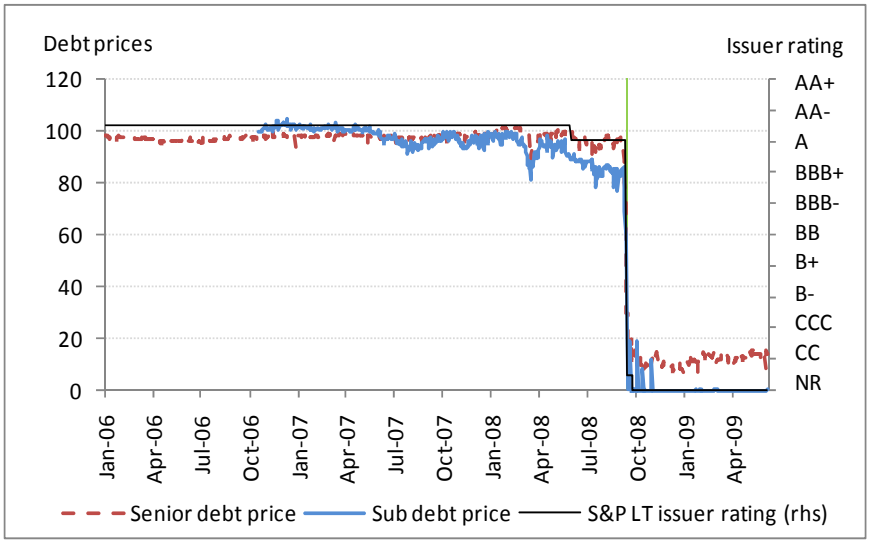


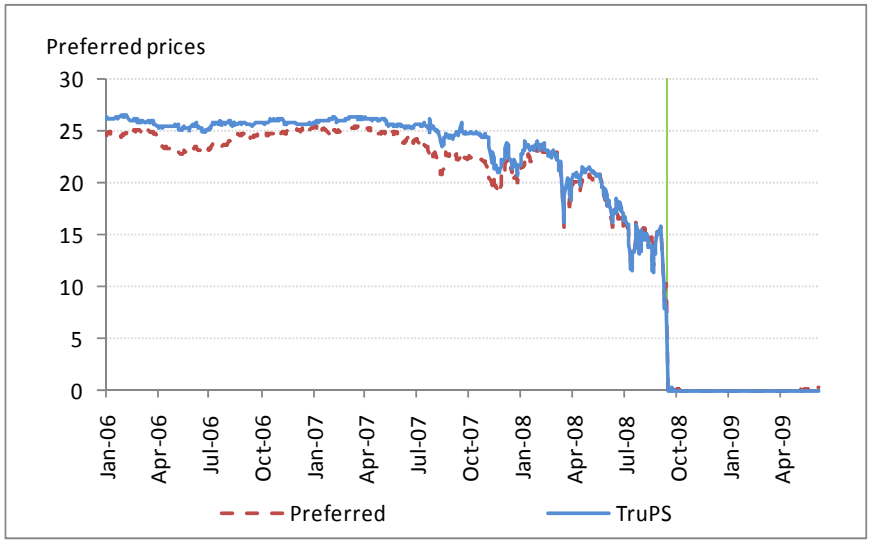


Lehman Brothers









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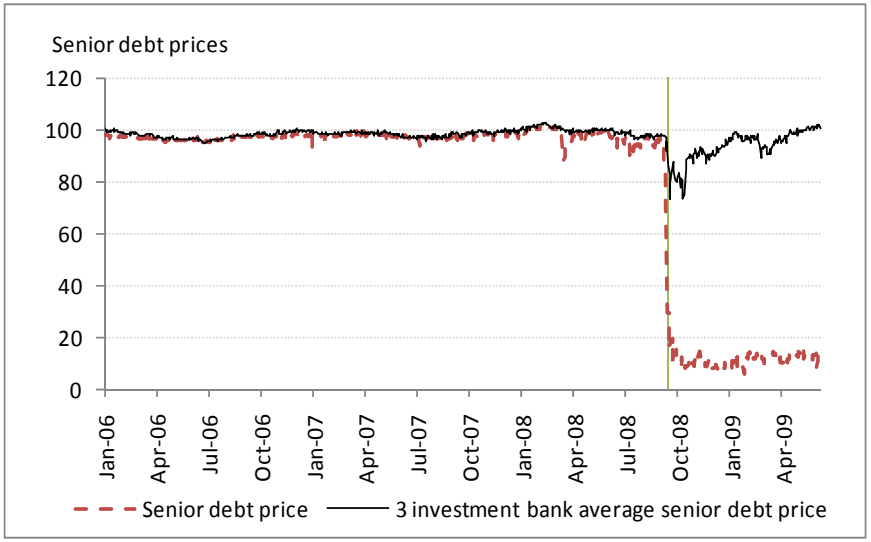
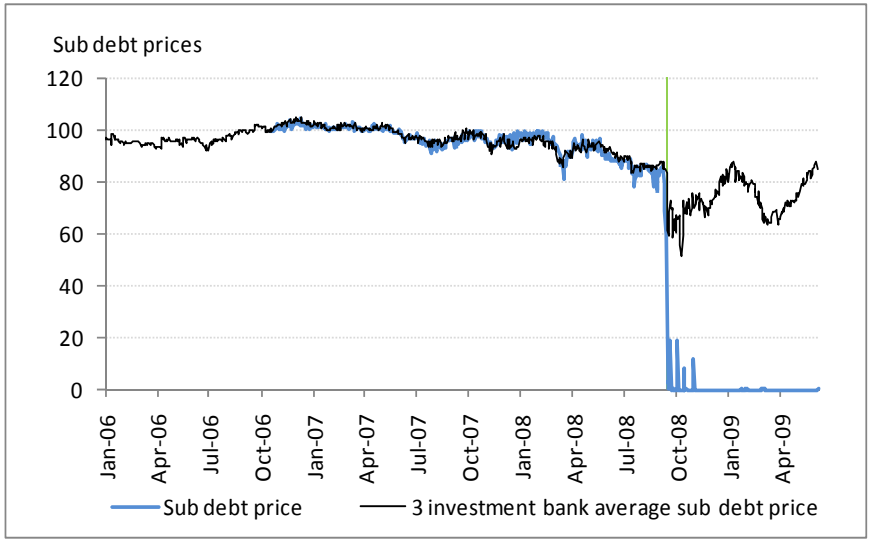
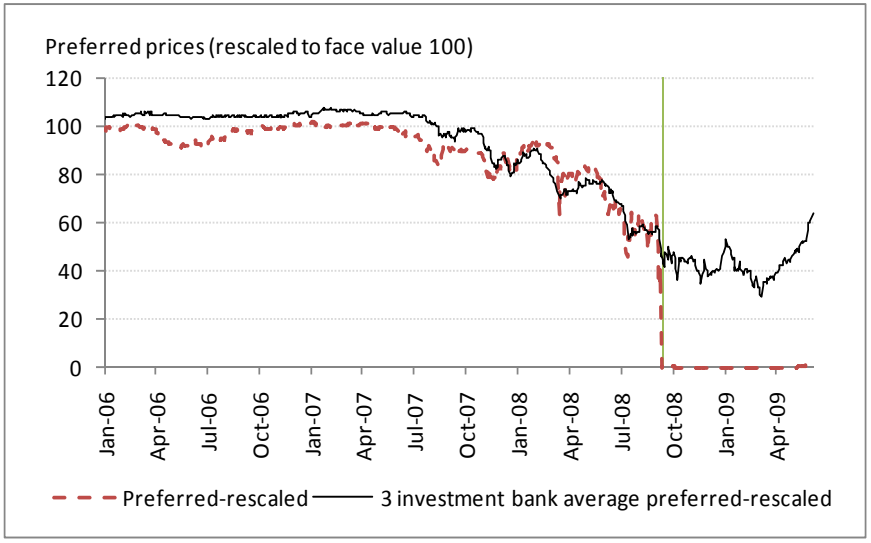
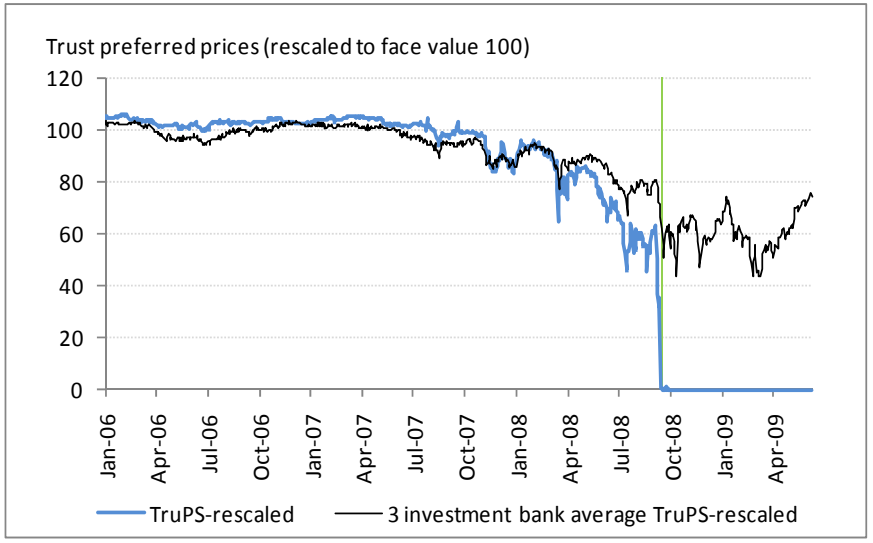
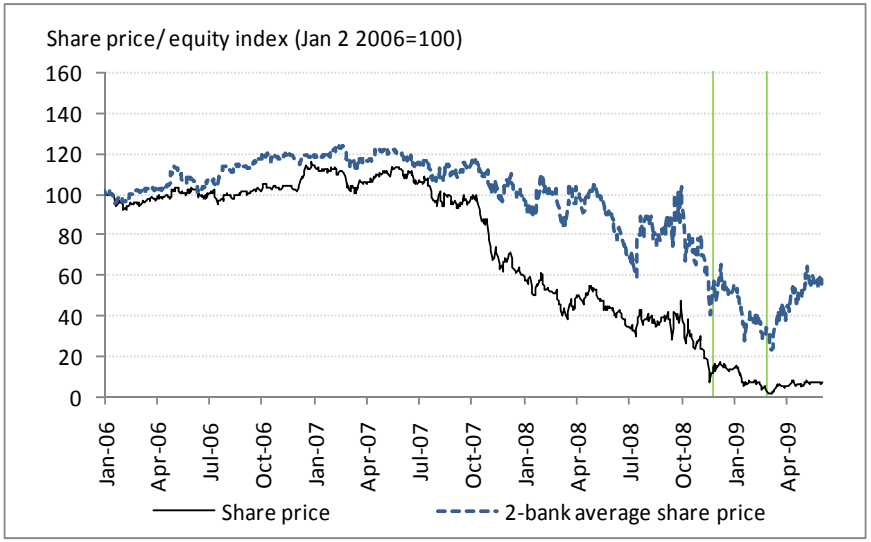








Citigroup


Share price/ equity index (Jan 2 2006=100)
160
140
120
100
80
60
40
20
0
Jan-06
Apr-06
Jul-06
Oct-06
Jan-07
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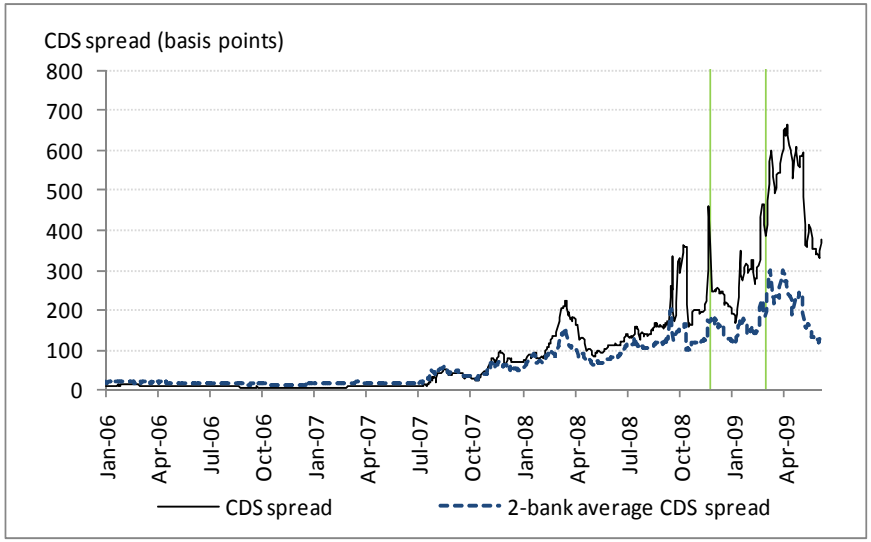
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
Share price
2-bank average share price


CDS spread (basis points)
800
700
600
500
400
300
200
100
0
Jan-06
Apr-06
Jul-06
Oct-06
Jan-07
Apr-07
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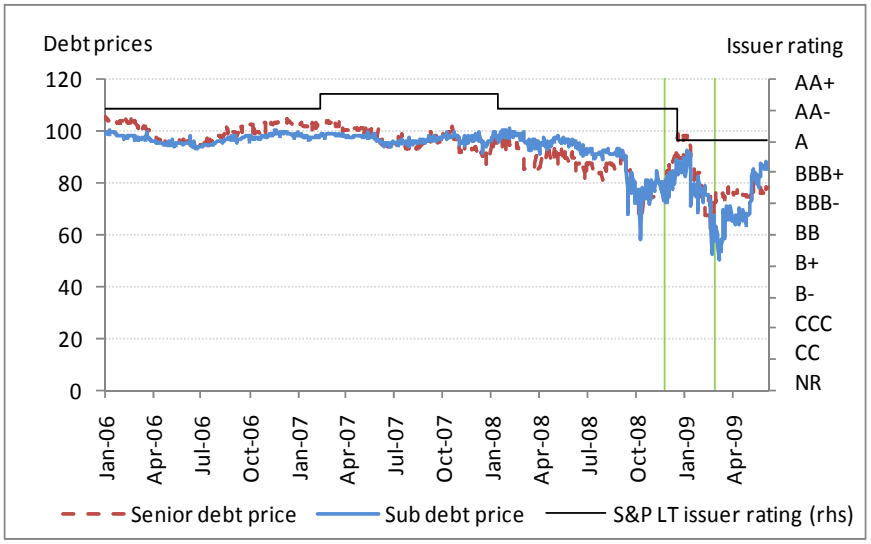
Oct-07
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
CDS spread
2-bank average CDS spread


Debt prices
Issuer rating
120
100
80
60
40
20
0
AA+
AA-
A
BBB+
BBB-
BB
B+
B-
CCC
CC
NR
Jan-06
Apr-06
Jul-06
Oct-06
Jan-07
Apr-07
Jul-07
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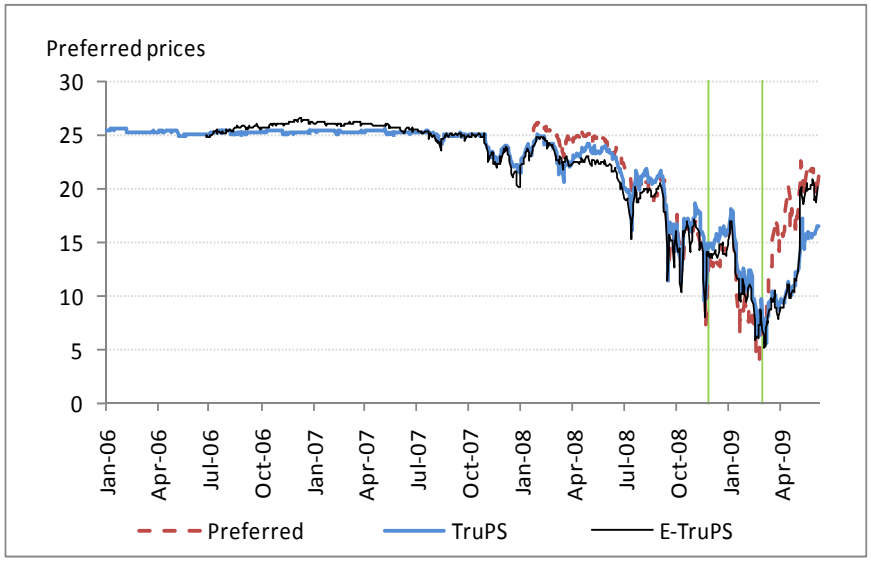
Oct-08
Jan-09
Apr-09
Senior debt price
Sub debt price
S&P LT issuer rating (rhs)


Preferred prices
30
25
20
15
10
5
0
Jan-06
Apr-06
Jul-06
Oct-06
Jan-07
Apr-07
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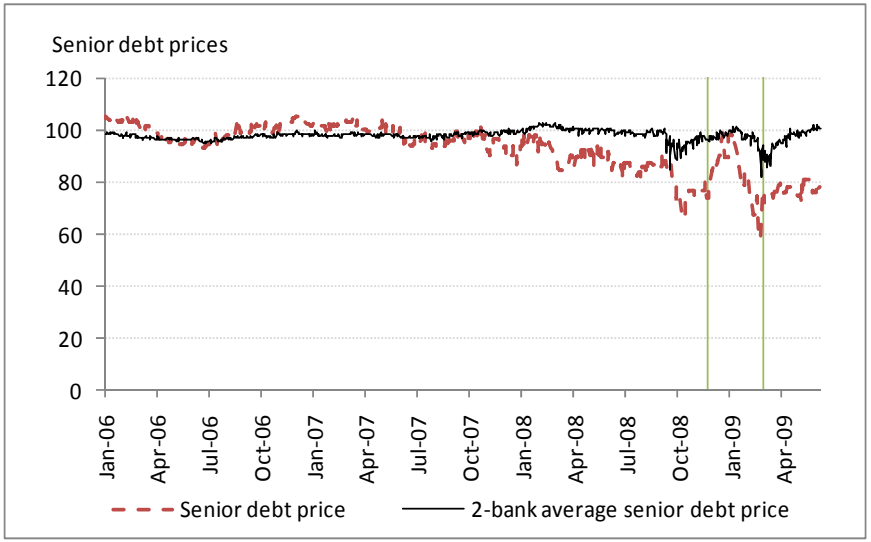
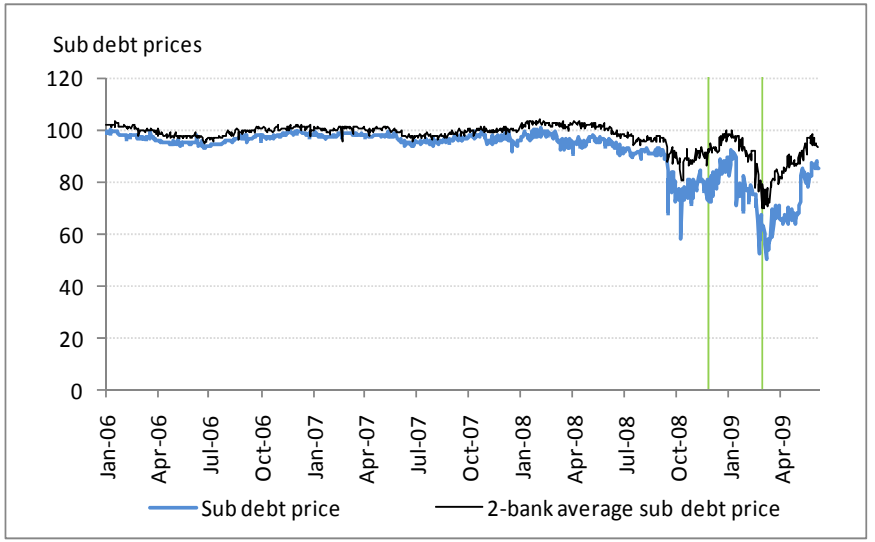
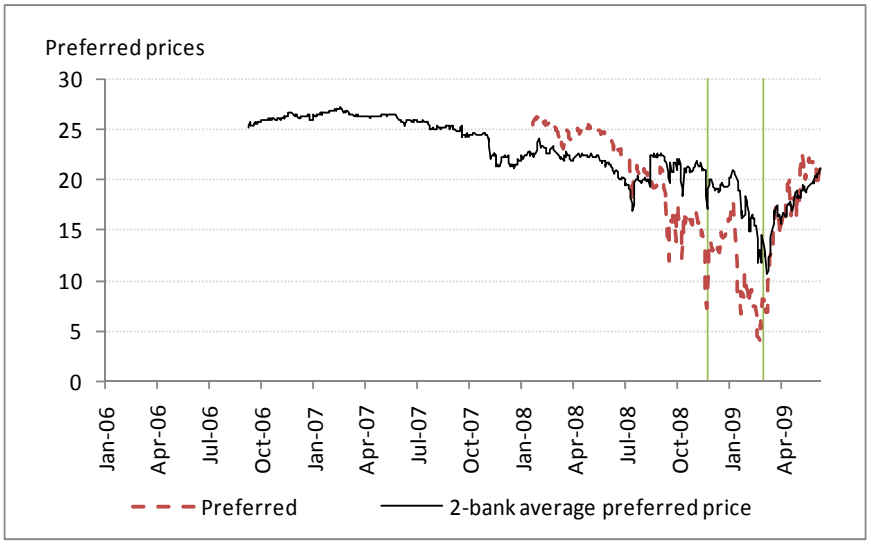
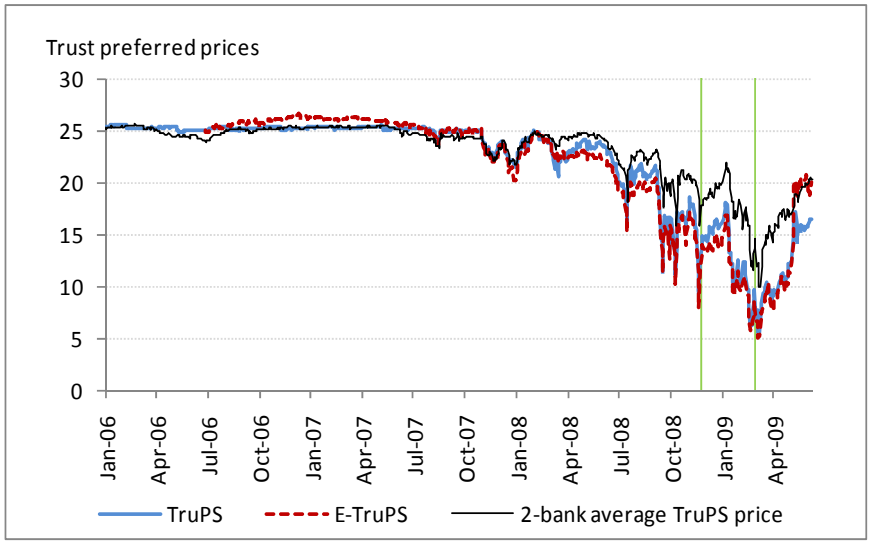
Apr-09
Preferred
TruPS
E-TruPS

Citigroup (cont.)

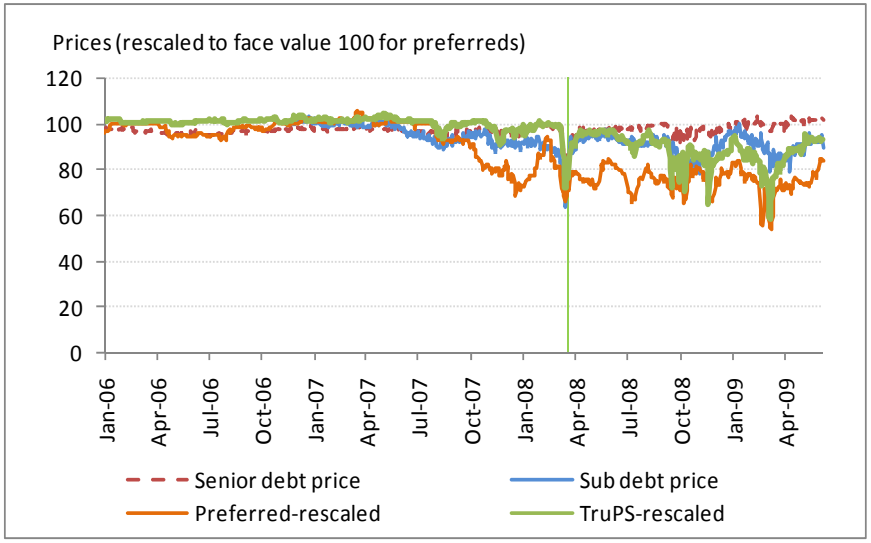




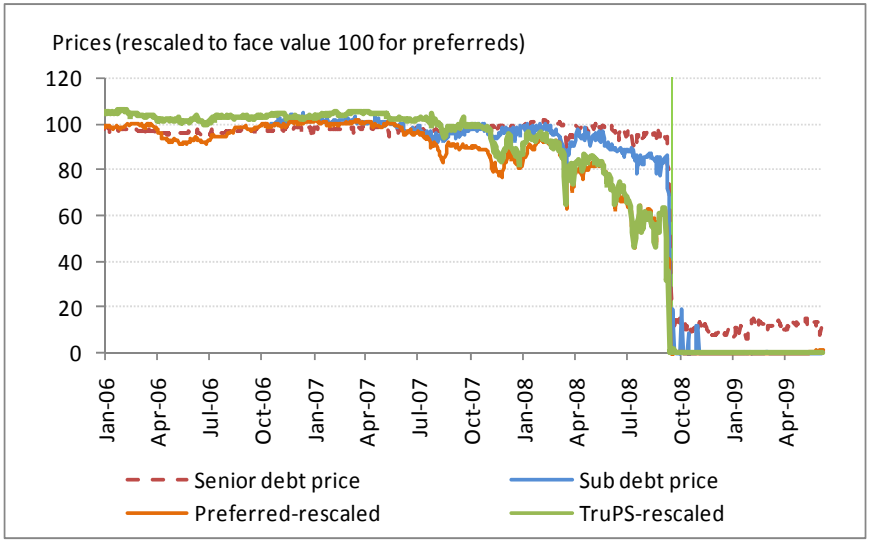




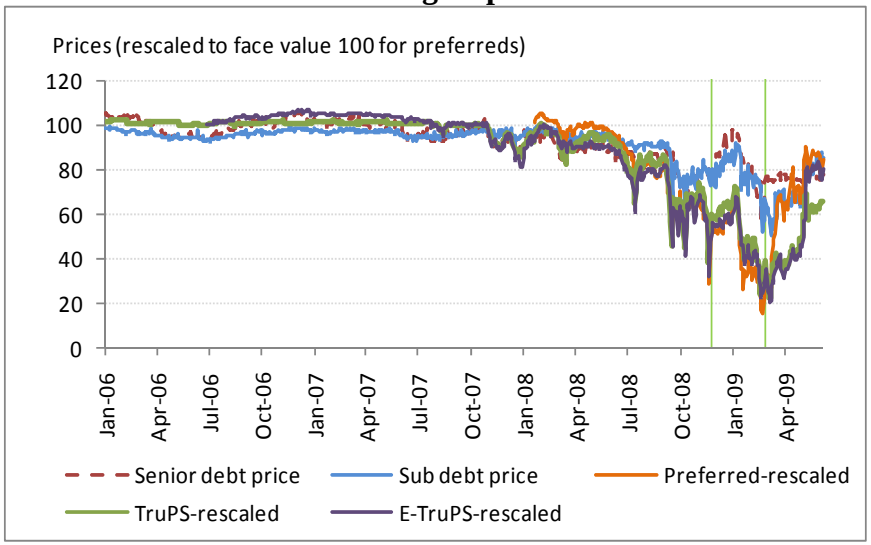
Bear Stearns



Lehman



Citigroup



Source: Bloomberg. Note: The green vertical lines indicate the date of the bankruptcy/intervention event for each bank.

Appendix II: Statistical Analysis of Bank Instrument Prices

To test more formally whether (and when) the prices of financial instruments provided signals that differentiated Bear Stearns, Citigroup, and Lehman Brothers from their healthier peers, a simple methodology is employed that is reminiscent of an event study. We first estimate the pre-crisis relationship between the daily change in the price of each instrument for these banks and the daily change in the price of the comparable market benchmark instruments over a time window from 2 January 2006 until 30 June 2007. We then use the model estimates to predict daily changes for the period starting on the 1 July 2007 up until the failure or intervention event of the bank being analyzed.

Under this approach, if market participants were not able to differentiate the additional riskiness of the three banks, the relationship that was calculated for the pre-crisis period would remain relatively stable until their failure/intervention event. In such a case, one would observe: 1) that the variability of the daily prediction errors would remain relatively stable; and 2) that the cumulative sum of these errors would be statistically close to zero. If, however, market participants started to differentiate the riskiness of these banks and reflect it in the prices of at least some of their instruments, one would begin to observe the opposite effect, i.e. increasing variance of daily prediction errors and of their cumulative sums.

The pre-crisis model that was used to create the predictions is specified as follows:

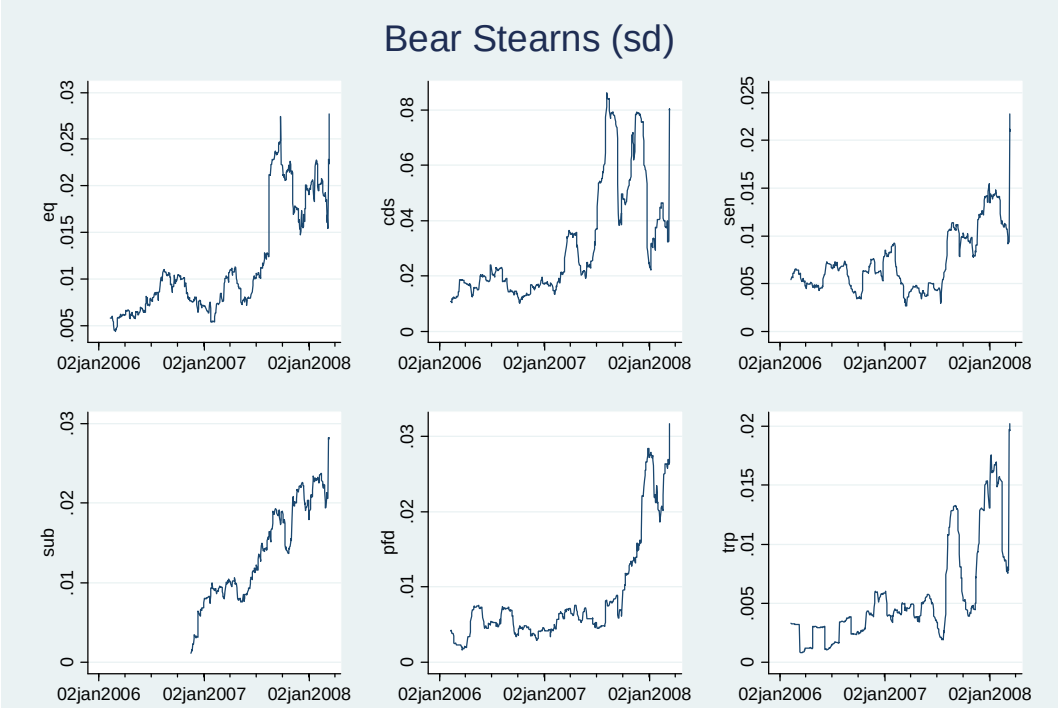
$$r_{ift} = \alpha_{if} + \beta_{if} Benchmark_{ift} + \varepsilon_{ift}, \qquad (1)$$

where *i* denotes the instrument (equity, CDS, preferred, trust preferred, senior debt, and subordinated debt), *f* denotes the firm (Bear Stearns, Citigroup, and Lehman), and *t* denotes the trading day. As previously mentioned, the benchmark group for Bear Stearns and Lehman consists of Goldman Sachs, Morgan Stanley, and Merrill Lynch, while JP Morgan and Bank of America form the benchmark for Citigroup. The failure/intervention events are 14 March 2008 for Bear Stearns, 15 September 2008 for Lehman, and 24 November 2008 for Citigroup.

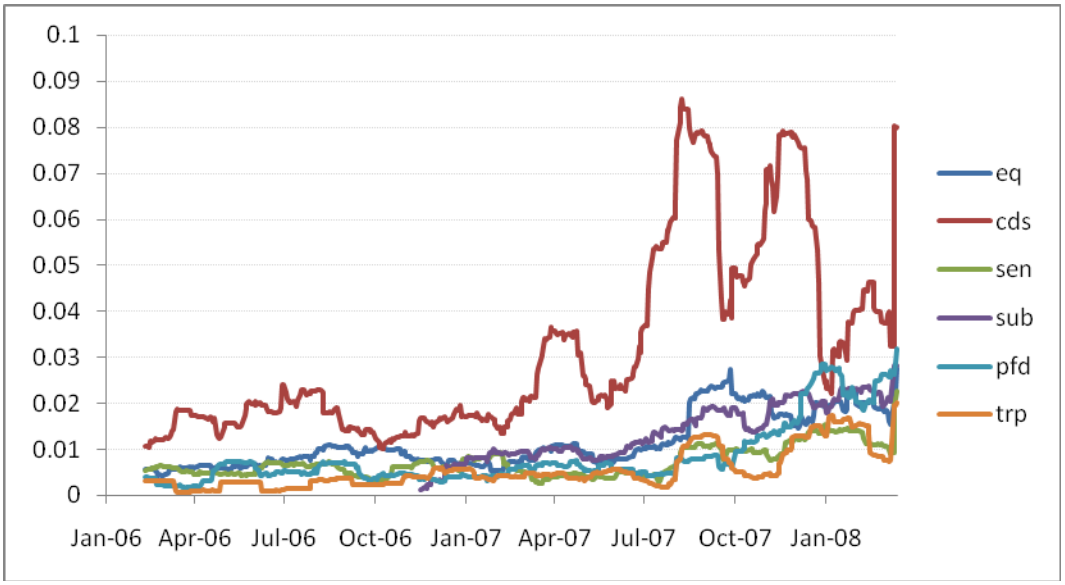
First, we calculate rolling standard deviations of the daily prediction errors over a thirty trading day window up to one trading day before the intervention event. An increasing series suggests that market participants began to distinguish the higher riskiness of the banks under analysis, thereby leading to a breakdown in the estimated pre-crisis relationship (Figure A-II.1).

Second, by making certain simplifying assumptions regarding the statistical properties of the various instrument prices, we are able to test whether (and at what time period) the divergence in the prices of the 3 banks under analysis from their benchmarks becomes statistically significant. This is done by testing whether the normalized cumulative sum of prediction errors is significantly different from zero. At a 95 percent confidence level, this implies that the size of the normalized cumulative sum of prediction errors must be larger than 1.96. Figure A-II.2 shows the cumulative sum of prediction errors and Figure A-II.3 shows the respective t-statistics for each bank instrument.

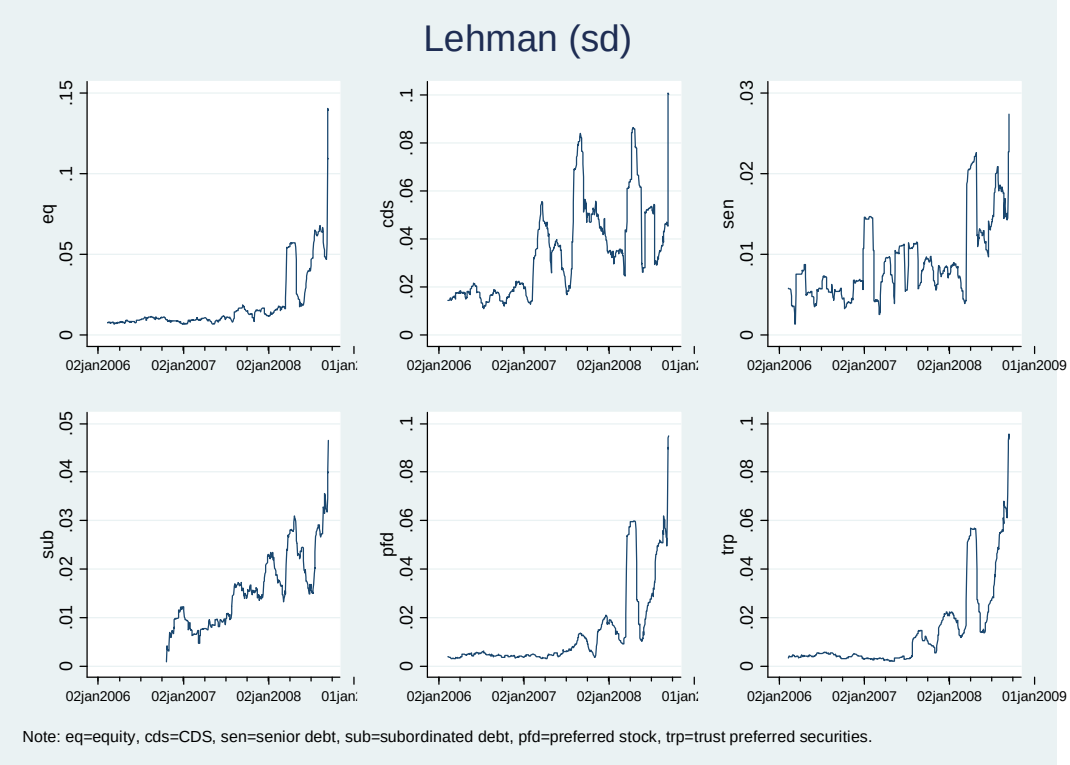
Figure A-II.1 Rolling volatility of daily prediction errors
Bear Stearns

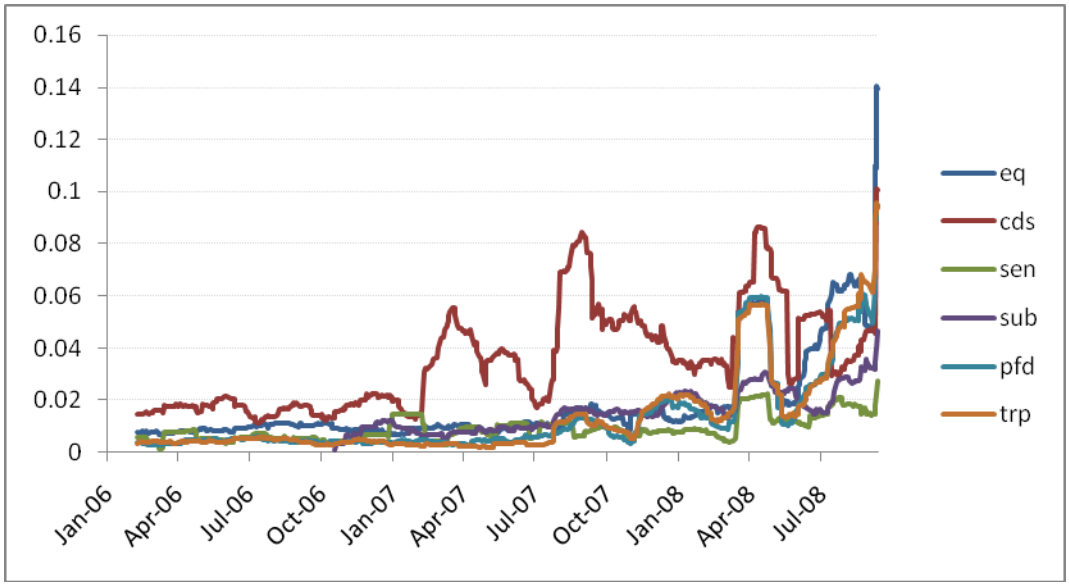


Note: eq=equity, cds=CDS, sen=senior debt, sub=subordinated debt, pfd=preferred stock, trp=trust preferred securities.

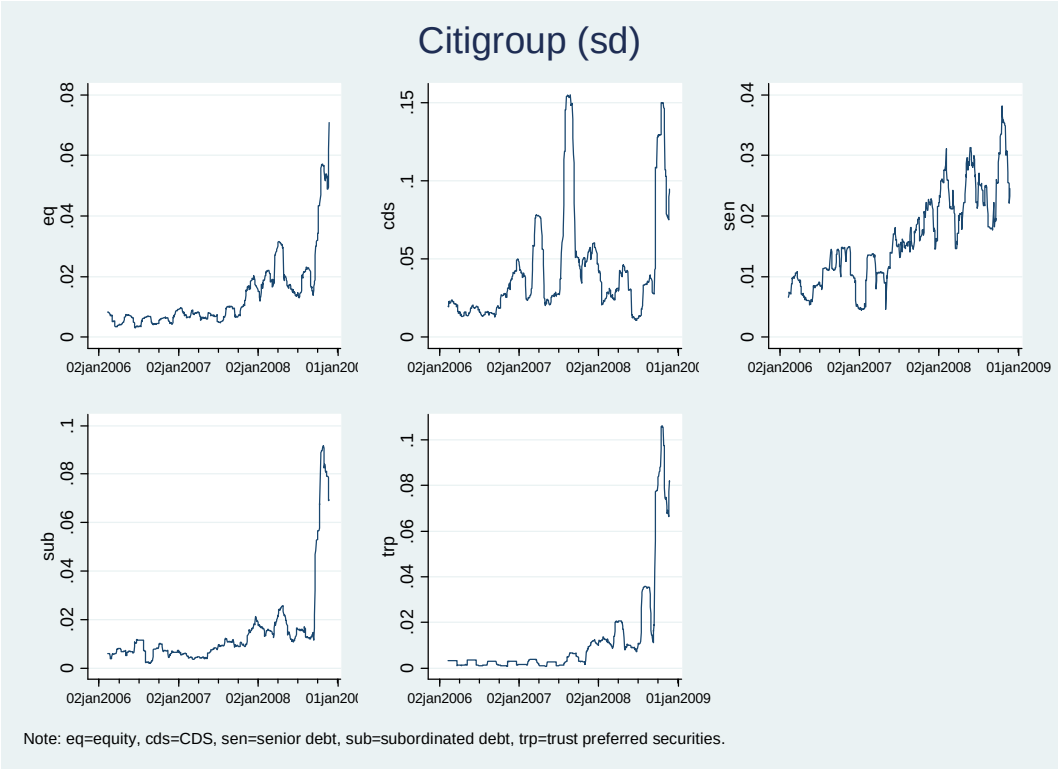


Lehman Brothers





Citigroup


Citigroup (sd)
eq
cds
sen
sub
trp
02jan2006
02jan2007
02jan2008
01jan2009
Note: eq=equity, cds=CDS, sen=senior debt, sub=subordinated debt, trp=trust preferred securities.

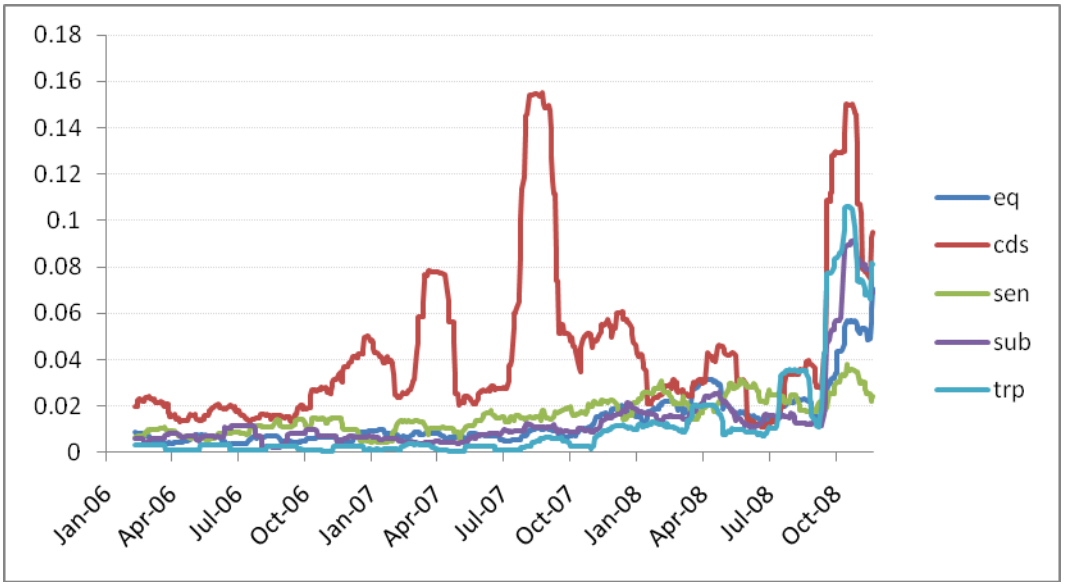
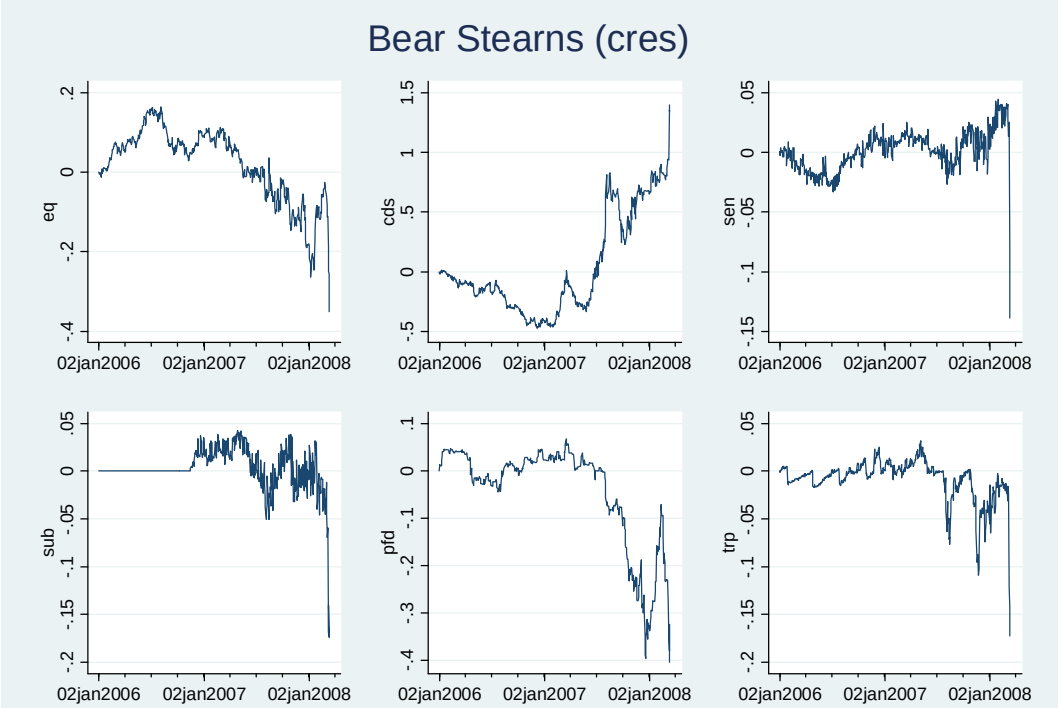
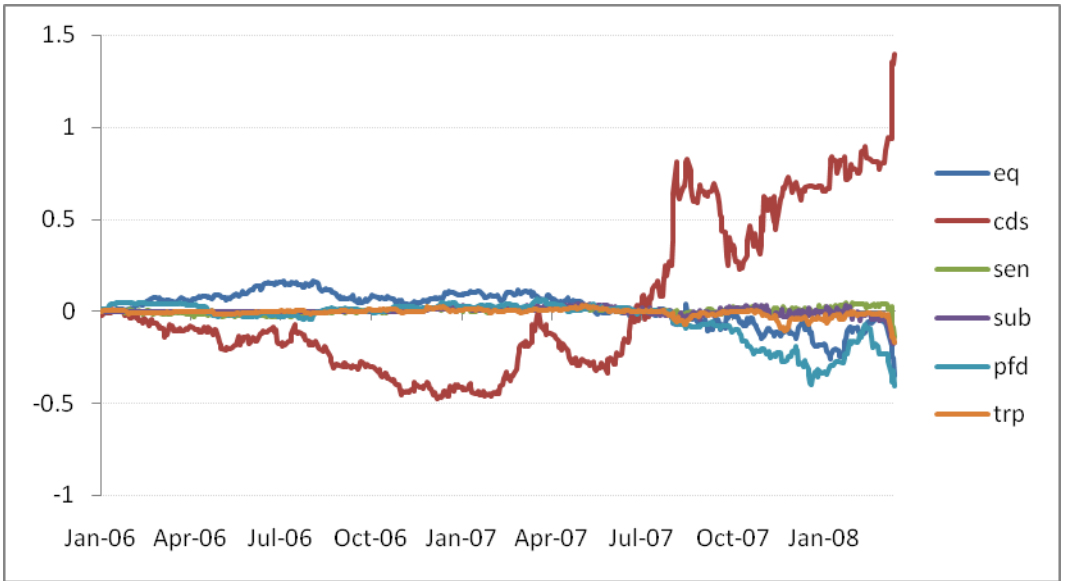

0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-06
Apr-06
Jul-06
Oct-06
Jan-07
Apr-07
Jul-07
Oct-07
Jan-08
Apr-08
Jul-08
Oct-08
eq
cds
sen
sub
trp

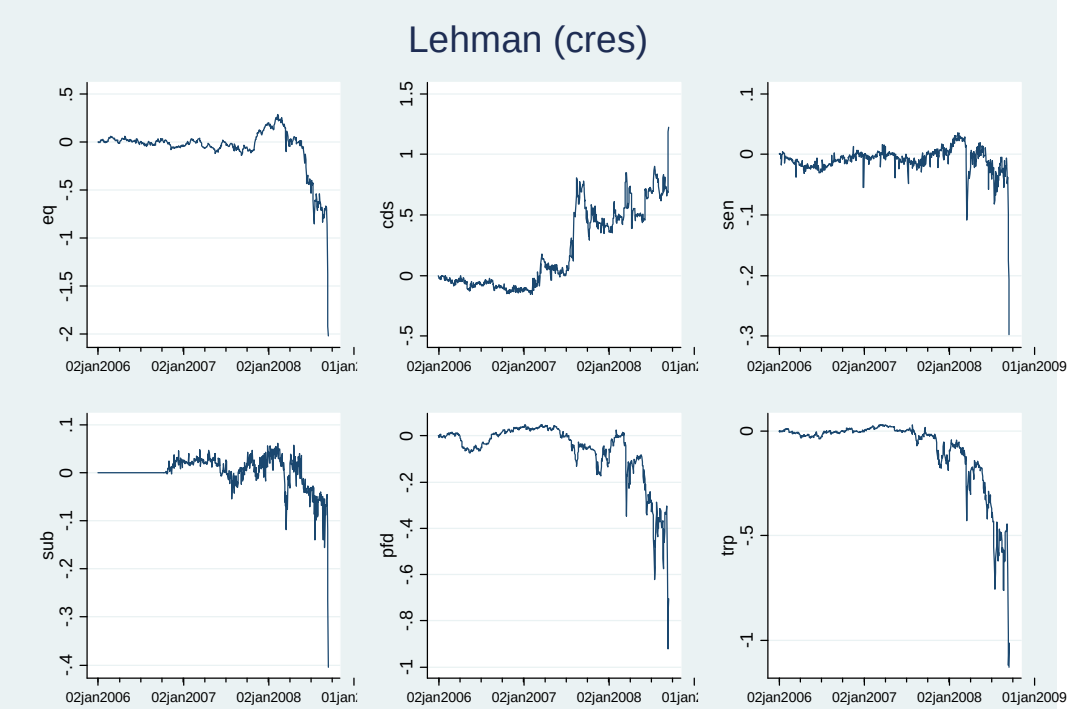
Figure A-II.2 Cumulative prediction errors
Bear Stearns



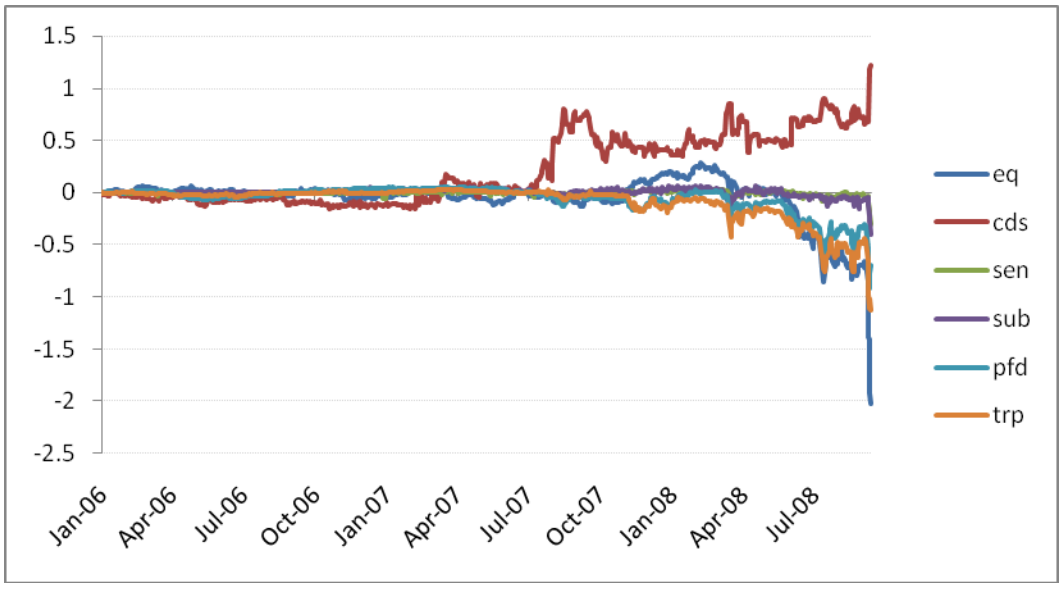
Note: eq=equity, cds=CDS, sen=senior debt, sub=subordinated debt, pfd=preferred stock, trp=trust preferred securities.



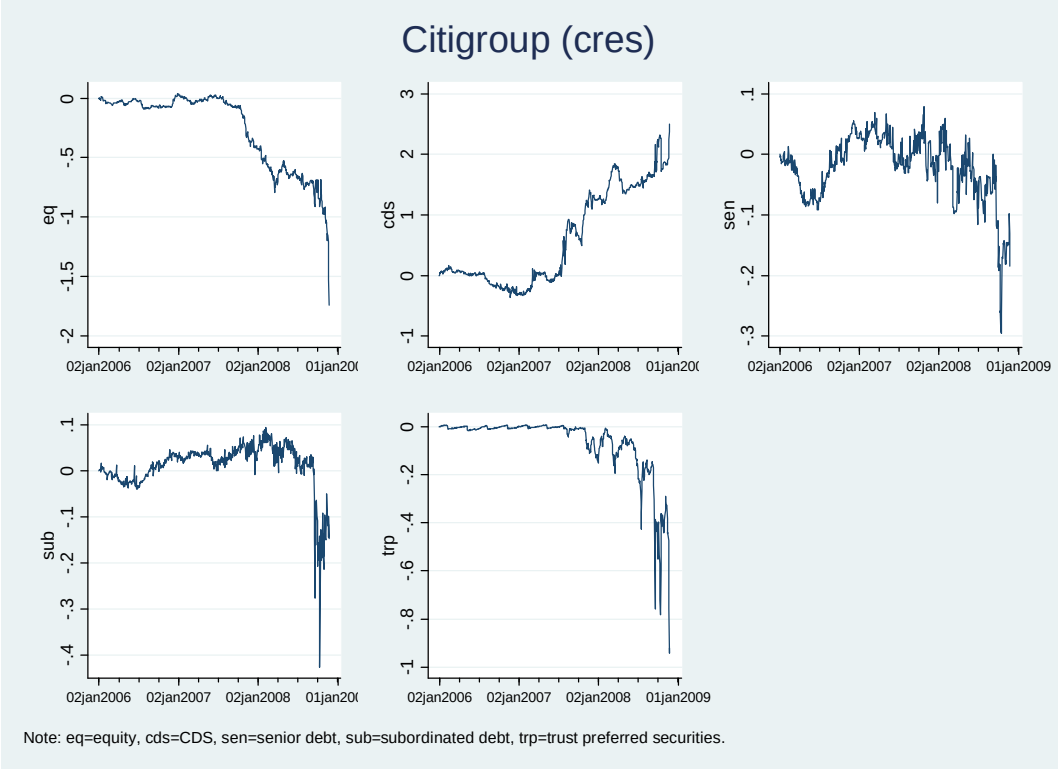
Lehman Brothers



Note: eq=equity, cds=CDS, sen=senior debt, sub=subordinated debt, pfd=preferred stock, trp=trust preferred securities.



Citigroup



Note: eq=equity, cds=CDS, sen=senior debt, sub=subordinated debt, trp=trust preferred securities.

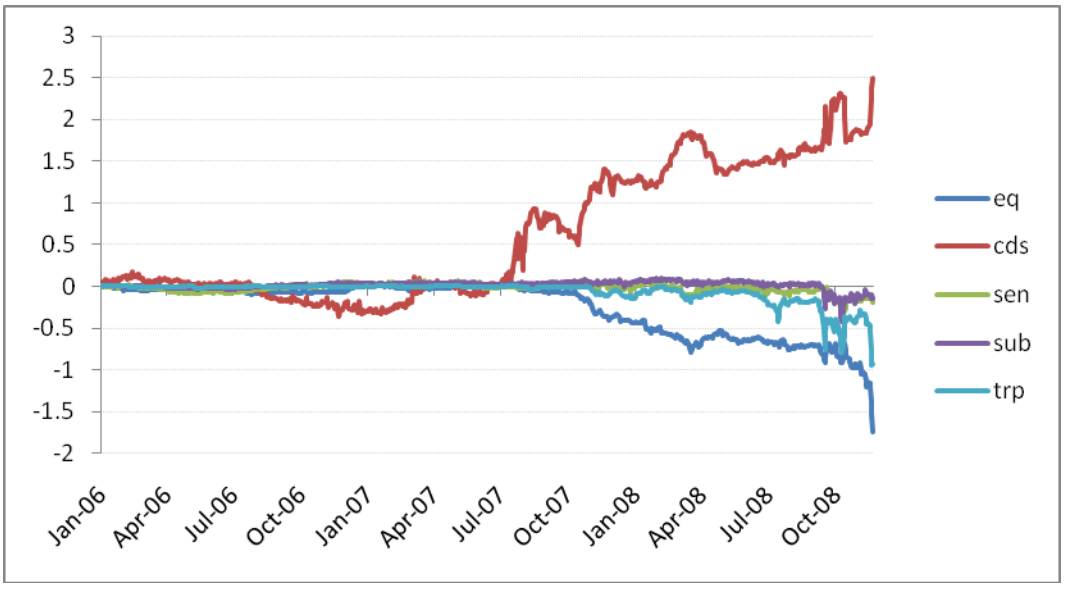
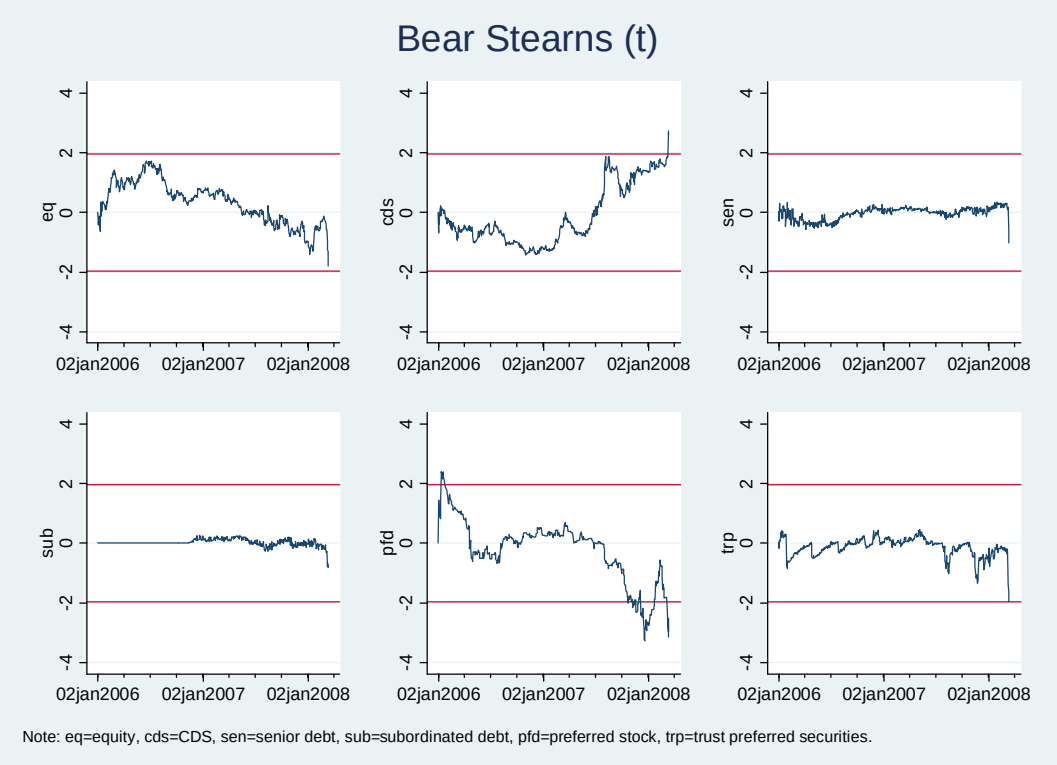


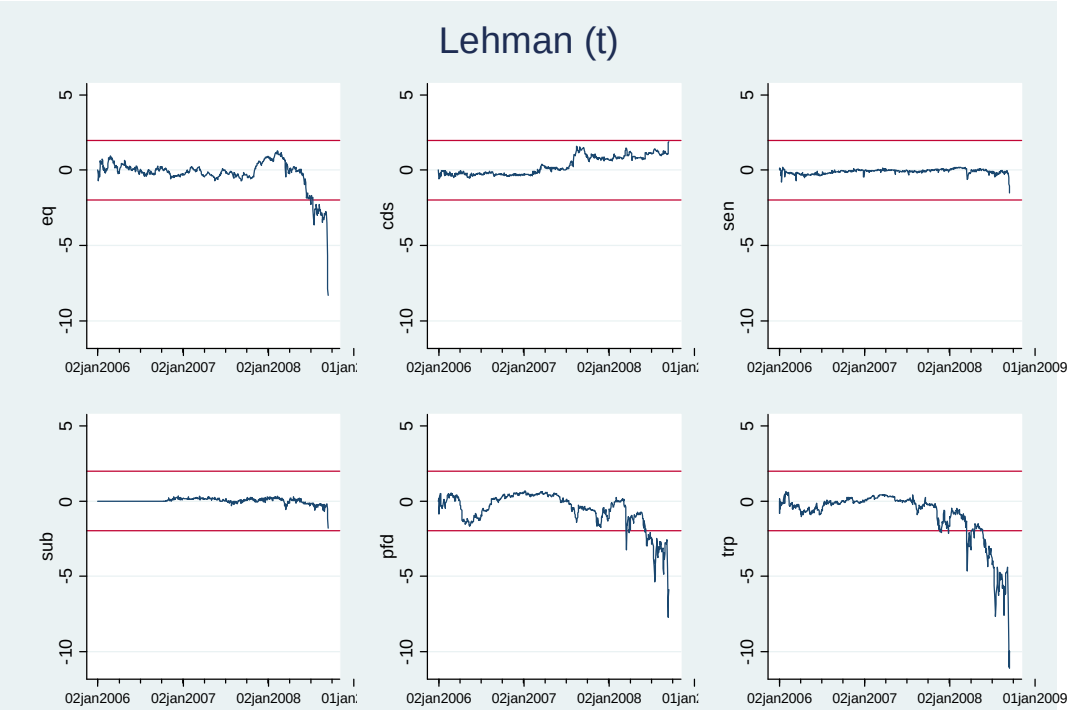
Figure A-II.3 t-Statistics on whether cumulative prediction errors are significantly different from zero

Bear Stearns



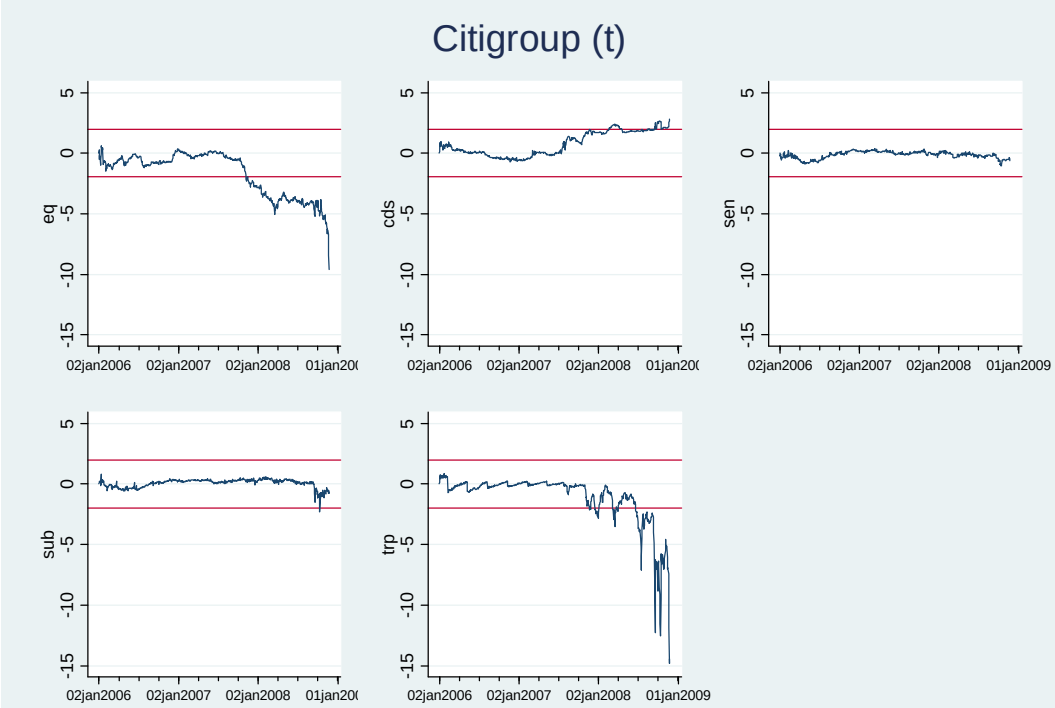
Note: eq=equity, cds=CDS, sen=senior debt, sub=subordinated debt, pfd=preferred stock, trp=trust preferred securities.

Lehman Brothers



Note: eq=equity, cds=CDS, sen=senior debt, sub=subordinated debt, pfd=preferred stock, trp=trust preferred securities.

Citigroup



Note: eq=equity, cds=CDS, sen=senior debt, sub=subordinated debt, trp=trust preferred securities.

Appendix III: Bank Securities Used in the Analysis

Since the prices of the same type of instrument for each bank tend to move closely together, the results discussed in this paper should not in principle vary significantly by the choice of specific instruments that were selected for analysis. The following bank instruments were chosen based on a few key criteria, such as issuance date (instruments issued prior to 2006 are preferable as they cover the entire sample period of analysis), size (larger issues are preferable to smaller ones since they tend to be more liquid), and comparability of terms between the instrument of the bank and of its benchmark. Of course, as can be seen below, the characteristics of the same instrument can sometimes differ substantially across banks.

Senior Unsecured Debt

Bank	Identifier (CUSIP)	Original Maturity (years)	Coupon Rate	Issue Size ($ Million)	Expiration (year)
Bear Stearns	073902CE6	7	4.5%	1,100	2010
Lehman Brothers	52517PA35	5	4.5%	1,000	2010
Merrill Lynch	EF0441602	5	4.79%	1,300	2010
Morgan Stanley	61746SBS7	5	5.05%	2,000	2011
Goldman Sachs	38143UAW1	10	5%	1,250	2014
Citigroup	172967CT6	30	5.85%	1,000	2034
JP Morgan	ED8252089	10	4.75%	1,250	2015
Bank of America	060505BF0	7	4.375%	1,000	2010

Subordinated Debt

Bank	Identifier (CUSIP)	Original Maturity (years)	Coupon Rate	Issue Size ($ Million)	Expiration (year)
Bear Stearns	073902PN2	10	5.55%	1,000	2017
Lehman Brothers	524908UB4	10	5.75%	1,250	2017
Merrill Lynch	59022CAB9	20	6.22%	1,350	2026
Morgan Stanley	61748AAE6	10	4.75%	4,000	2014
Goldman Sachs	38143YAC7	30	6.45%	1,500	2036
Citigroup	172967CQ2	10	5%	4,083	2014
JP Morgan	46625HAT7	10	5.75%	1,750	2013
Bank of America	060505BG8	12	5.25%	700	2015

Perpetual Preferred Stock

Bank	Identifier (CUSIP)	Original Maturity (years)	Dividend Rate	Issue Size ($ Million)	Expiration (year)
Bear Stearns	46625H712	Perpetual	5.72%	200	-
Lehman Brothers	524908720	Perpetual	6.5%	300	-
Merrill Lynch	060505591	Perpetual	Libor+75bps	240	-
Morgan Stanley	61747S504	Perpetual	Libor+70bps	1,100	-
Goldman Sachs	38144X609	Perpetual	Libor+75bps	200	-
Citigroup	172967572	Perpetual	8.125%	3,715	-
JP Morgan	46625H621	Perpetual	8.625%	1,800	-
Bank of America	060505831	Perpetual	6.204%	825	-

Trust Preferred Stock

Bank	Identifier (CUSIP)	Original Maturity (years)	Dividend Rate	Issue Size ($ Million)	Expiration (year)
Bear Stearns	07384T206	-	7.8%	263	-
Lehman Brothers	52520X208	-	6.24%	200	-
Merrill Lynch	59021K205	-	7.28%	850	-
Morgan Stanley	617462205	-	6.25%	620	-
Goldman Sachs	38143VAA7	30	6.345%	2,750	-
Citigroup	17306N203	-	7.125%	1,150	-
JP Morgan	481228203	-	6.35%	500	-
Bank of America	055187207	-	7%	575	-